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ABSTRACT

Two major objectives of the Metropolitan Environmental Education Resources Study were: (1) to produce a directory of sites around Columbus, Ohio, having fieldtrip potential; and (2) to test the validity of the concept that field trips are a useful method in aiding student educational growth. The first section of this document relates the history of the project. The second section consists of the teaching materials used at the fifth grade level, including a critical thinking unit about the environment and field trip observation sheets. The next section describes the preparation of the test instrument and the testing procedures used in the study, and includes a copy of the test instrument. The final section presents the set-up and analysis of the study concerned with using field trip activities with fifth grade students. The author concludes that students in the treatment group involving field trips showed significant changes from pretest to posttest. (DT)

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Metropolitan Environmental Education Resources Study

name _____

SE 017 989

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community profile / program profile

WORTHINGTON: A COMMUNITY PROFILE

The following is an historical sketch which appears as part of the Annual Report - 1971 of the City of Worthington. It illustrates very well the vision of the first settlers from New England regarding the importance of education for their children and for future generations. "The village of Worthington was founded in 1803, the year of Ohio statehood, by members of the Scioto Land Company which had, the year before, been formed in Granby, Connecticut. Eleven families left their New England homes in September, 1803, and established residence the following month in log cabins already built by an advance party. The village was named by James Kilbourne, community leader, in honor of Thomas Worthington, who had actively advocated Ohio statehood and who later served as State Senator and Governor. Before leaving Connecticut, a 1600 acre tract, purchased at a $1.25 per acre, was planned with boundaries at North and South streets, and Morning and Evening streets. A typical New England village green marked the center, and each family purchased a 'town lot' to live on and a 'farm lot' for food and income. Town and farm lots were set aside for the public school and for the church." Worthington was incorporated in 1835, and when its population was determined to be in excess of 5,000, the village became a city by law. This event occurred in 1956. The population breakdown for 1972 (based on the 1970 census) is as follows:

Total population . . .	15,326
Males	7,480
Females	7,846
Under 18 years	6,246
65 years and over . .	821
Median age	26.8

Another category of interest is the education background of parents in the Worthington School District. The breakdown, based on the level of

education, follows:

Less than a High School education	1.6%
Less than four years of High School	4.5%
High School graduates	93.0%
Attended college	67.0%
College graduates	39.0%
Master's degree	11.0%
Doctoral degree	4.4%

The number of high school graduates who plan to attend college gives still another insight or index into the Worthington Community Profile. The 470 graduates of the Class of 1971 were grouped into six categories. Those categories and the number of students in each category follow:

number planning to attend	college or university group
198	state universities in Ohio
55	private colleges in Ohio
33	state universities - out of state
41	private and independent colleges - out of state; including the military academies
43	technical training
113	other (military, marriage, employment, undecided and unranked.)

Thus more than 75% of the graduating Class of 1971 plan to attend college. The two categories - "educational background of parents," and "the number of high school graduates who plan to attend college" are entered as supportive evidence for my belief that the taxpayers of Worthington are willing to "pay the price" (1) because they have experienced the value of a good education themselves, and (2), because they want at least the same opportunity for their children. This attitude, which has been consistently reflected at the ballot box, along with a reasonably farsighted administration has resulted in a functional system and has produced a stimulating and creative climate in which to work. The three most important components are resources, both human and financial, public commitment, and leadership with direction.

PROGRAM PROFILE

The Worthington Outdoor Education program began in the mid-1940's. Its growth and evolution has been slow but reasonably steady. The program began at the high school level, with the planting of a school "forest" on the high school site. As the school forest area matured there was increased use as a school land laboratory. Eventually one of the high school science teachers was given release time to create a more extensive program and thus generate more use of the land laboratory. His approach was to offer guided walks through the nature trail to interested elementary teachers and their classes. This program did generate a growing interest among many of the teachers in the elementary schools. In addition, several of the elementary teachers expressed an interest in expanding the program and activities even more. This expansion of the program was accomplished through a pilot day camp experience (1964-65), and a pilot resident outdoor education experience (1965-66).

"During the 1966-67 school year, seven suburban school districts cooperated on a Title III (P.L. 89-10) planning project on conservation and outdoor education." The grant application for the proposed project was entitled Developing Facilities and Program for Conservation and Outdoor Education in Suburban School Districts of Franklin County, Ohio. "The Worthington School District was the official project applicant. The other six districts were: Grandview Heights, Liberty-Union (the southern half of Delaware County, adjoining Worthington and Westerville Districts), Mifflin Local, Scioto-Darby (Hilliard), Upper Arlington, and Westerville. The seven districts enroll[ed] 32,000 pupils . . . . Identified as a feasibility study, the project was to determine need and readiness for program facilities for conservation and outdoor education."

It was finally agreed that the school districts which had participated in the initial project planning phase would be asked to indicate their support of the next stage(s) of the project " . . . by cooperatively employing a coordinator of outdoor education without condition, that is whether or not Title III support was continued." Only three of the original seven districts agreed to this proposal. They were - Grandview Heights, Westerville, and Worthington. A full-time coordinator was hired for the 1967-68 school year. In the summer of 1968 the full-time staff was expanded to include two additional certified personnel and full-time secretary.

During the Tri-District Outdoor Education Project several areas were identified which were to be emphasized as major components of the total project thrust. They were (1) school-site and neighborhood activities, (2) fieldtrips away from the school and immediate neighborhood, but within Franklin County and southern Delaware County, and (3), a resident outdoor education program which was located at a camp site outside the county. Thus the study locations and related program activities were designed to be carried out at increasingly greater distances from the school site as the children gained physical, emotional, and intellectual maturity. This range of activities might be conceptualized in a diagrammatic model. This model would have three circles. The smallest circle would represent the location of the school site and neighborhood explorations. (Thus the child's initial explorations would be carried out in a presumably familiar area where he is more or less "at home.") The intermediate circle would represent the various fieldtrip sites, and the largest circle would represent the resident outdoor education site(s). In fact, the range of activities would be more amoeba-like because suitable fieldtrip sites are not evenly distributed throughout the landscape.

Eventually the major fourth grade activity became one or more fieldtrips to one of the land laboratory sites. The fifth grade curriculum, particularly science, was especially suited to firsthand observations such as those which can be accomplished through fieldtrips. The sixth grade resident outdoor education program was based on a curriculum designed to integrate outdoor education activities and experiences with the child's classroom experience. Consequently the culminating activity (resident outdoor education) of the child's elementary school career is based on the cumulative experiences of both indoor and outdoor education. Thus outdoor education is an integral part of the total elementary school program - not just added on to it. (The outdoor education department is currently expanding the outdoor education program downward into the primary grades.)

The majority of activities in the outdoor education program have been nature-study oriented. With the recent emphasis on the total environment based on an ecological point-of-view, the outdoor studies in an urban environment are taking a place of equal educational value with outdoor studies in a rural environment. Outdoor education in an environment which is dominated by natural features is usually thought to be located in a suburban or rural area in relatively large green spaces like parks. This has been the stereotyped view of the "best" outdoor education site, and "getting away from it all," or "getting back to nature" was a major correlary to this point-of-view. Recently educators have come to realize that the urban environment which is dominated by its man-made features has great environmental education potential.

GRADE LEVEL - WHY 5?

Since the sixth grade in Worthington participated in the resident outdoor education program, it was decided to introduce the Metropolitan

Environmental Education Resources Study units at the fifth grade level. This decision was based on four criteria - viz., (1) a need for the students to become aware of the environment - both natural and manmade, (2) the students would have a reasonably adequate background in terms of their data collecting ability, (3) the addition of this program at the fifth grade level would not be as great a burden to them as it would be to the sixth grade teachers with their resident outdoor education responsibilities, and (4), this environmental study sequence - viz., the study of an urban environment and the study of a natural environment, in the fifth and sixth grades respectively, would create a situation of potential comparisons about the man-dominated urban environment and the natural environment. Thus this structural sequence creates the potential for involvement over a longer time period than just the duration of the unit itself.

directory

THE FIELDTRIP DIRECTORY

The Metropolitan Environmental Education Resources Study had two major objectives. They were: (1) to survey a number of Columbus industries and to produce a directory of sites with fieldtrip potential; and (2), to test the validity of the concept that fieldtrips are a useful method in aiding student educational growth.

The primary objectives of the directory were: (1) to design a functional, operational structure to collect data for a directory of environmental education resources available for study in the metropolitan area; (2) to establish criteria for data to be used in the directory; (3) to collect the data; and (4), to produce a directory and make it available to interested teachers in the metropolitan area.

In the text, A-V Instruction: Materials and Methods, by Brown, Lewis, and Harcleroad, the authors include a discussion about school district studies. (The Metropolitan Environmental Education Resources Study is not a school district study in that the Worthington City School District is only a part of the much larger Columbus metropolitan area. However, the statements by Brown, et. al., provide valuable information.) The authors state - "School districts have carried on community studies in many diverse ways. All the studies appear to have value; all require careful planning." (Brown, et. al., pp. 393-395.) The authors also included samples of questions used by two schools for community resource studies. The community schools involved were; Whittier, California, and Portland, Oregon.

The Portland Study "developed a guide to community resources. Persons making the study attempted to obtain the following information about possible places to visit: the location, the person to contact for arrangements, the

nature of the work to be observed by visitors, and other specific questions, including the following:

Do you permit school children to visit your establishment?

What age children do you prefer?

How many groups per week can you handle? How many in a group?

What times of day do you prefer visits?

How much advance notice is required?

How much time is required for an adequate visit?

Are guides provided for trips through your establishment?

Do you have individuals available for talks to schools?

Can pictures be taken in your plant for school use?

Do you have an education or public relations department?

Does your establishment provide any educational materials which could be used in schools (films, books, exhibits, sample materials, models, or charts)?

What special instructions are necessary for visitors?"

The Whittier Study also produced a survey form. It dealt specifically with governmental and welfare services. It was inclusive enough that a copy is reproduced in this report. (See the survey entitled "Whittier Survey Investigator's Report: Governmental and Welfare Services.") The survey form prepared for the Metropolitan Environmental Education Resources Study is largely a composite of these two sets of survey questions. (A copy of the questionnaire and a copy of the letter introducing the questionnaire is also included.)

As the survey questionnaire was being prepared, a list of industries in the Columbus metropolitan area was also secured. This information was available in a Columbus Metropolitan Chamber of Commerce publication entitled Manufacturers Directory: Columbus, Ohio, 1970-1971.

Below is a sample entry from the Manufacturers Directory:

*CONTINENTAL CAN CO INC
6767 HUNTLEY ROAD WORTHINGTON 43085
888-1515
SIC - 3411
METAL CONTAINERS
EMP - 75 MALE - 75 EST - 1967 L/C CORP
PARENT - CONTINENTAL CAN CO INC
633 THIRD STREET NEW YORK N Y
MARVIN C SOWINSKI PLANT MANAGER
MICHAEL S ANDERSON STAFF SUPT
MARVIN REED PLANT SUPT

The information included in this directory (besides the obvious name, address, and phone number, etc.,) indicates the market served, the type of organization, subsidiaries, branches or major divisions, the parent company (if applicable), and the names and major job classifications of the local executives. It should be obvious that this directory saved much duplication of effort and many hours. A list of one hundred (100) businesses and industries was selected from this directory. An effort was made to select businesses and industries which would be using a broad range of natural resources in their manufacturing or production processes. After the survey questionnaire and the list of survey participants had been prepared a mail survey was conducted. The response to the questionnaire follows:

65% - no return
35% - response to the questionnaire

For the survey purposes the most crucial question/answer on the returned questionnaires was number seven, which asked - "Do you allow plant tours?" Based on the 35% which returned their questionnaires, the "yes" and "no" breakdown was as follows:

57% (or 20 responses) - "no" (DO NOT allow plant tours)
43% (or 15 responses) - "yes" (DO allow plant tours).

The remainder of this section of the report includes - the Whittier Survey entitled "Whittier Survey Investigator's Report: Governmental and

Welfare Services," a copy of the letter introducing the Metropolitan Environmental Education Resources Study survey, and a copy of the survey, a list of businesses and industries surveyed entitled "Survey Mailing List for Fieldtrip Directory," and a copy of the beginning directory which consists of the fifteen respondents that indicated "yes" to question seven - "Do you allow plant tours?"

WHITTIER SURVEY INVESTIGATOR'S REPORT
GOVERNMENTAL AND WELFARE SERVICES

Name of service _____ Date of Contact _____
Address _____
Telephone _____ Name of person contacted _____
Name and title of person to be contacted for trip arrangements:
Name _____ Title _____
Indicate age groups which would profit by a visit to this service. Specify which processes or departments are appropriate for the various age levels:
Primary (K-3) _____ Upper (7-8) _____
Middle (4-6) _____ Secondary (9-12) _____
Is it possible for the teacher to make a preliminary trip? _____
What is the total number of persons which may be accommodated at any one time? _____ How many can be accommodated per guide? _____ How many guides are available? _____ (Any department where there is a great amount of noise need to plan for additional guides.)
What hours are most suitable for visits? _____
What days are convenient? _____
How much time is required for the trip? _____
What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed. _____
_____
Is first-aid service available to visitors? _____
What materials are available for distribution or borrowing; pamphlets, films, charts, models, and so forth? _____
What area or group does this organization service? _____
What is the source of funds which supports this service? _____
What statistics are available indicating extent of service? _____
Who is the director of this organization? _____
How is the service organized? Indicate departments, etc. _____
What is the general plan of departmental organization? Indicate civil-service appointment, and so forth. _____
How many people are employed? Men: Full time _____ Part time _____
Women: Full time _____ Part time _____
Are there any age or other restrictions? _____
What training is required for employment? _____
How much training is given on the job? _____
What are the opportunities for advancement or upgrading? _____
_____
What is the minimum wage? _____
What are the hours of work? _____
What laws govern this service? _____
What safety measures are required? _____
What are the health and sanitation regulations? _____
How are these regulations enforced? _____
Additional information _____

METROPOLITAN ENVIRONMENTAL EDUCATION RESOURCES STUDY

600 WEST DUBLIN-GRANVILLE ROAD
WORTHINGTON, OHIO 43085
(614) 888-0357

February 22, 1972

Dear Sir:

Permit me to introduce myself and the study represented by the enclosed questionnaire. I am the Outdoor Education Teacher-Director of the Worthington Outdoor Education Department. I received an education award from the Martha Holden Jennings Foundation, Cleveland, Ohio, this past summer. My intention is to inventory the many educational resources of the Columbus metropolitan area. The study will include the following components - a pre-test, four fieldtrips (to a brick manufacturing plant, an electric generating plant, a waste water treatment plant and a water treatment plant), a post-test, and a directory of fieldtrip locations in the metropolitan area. The last item will be the direct outcome of this questionnaire. This questionnaire will then be summarized to teachers in the central Ohio area.

I am taking the point-of-view that a quality environment is essential to the well being of mankind. But all of us must also become aware of the following: (1) we are all consumers and therefore have an individual and collective responsibility for the quality of the environment; and (2), if WE (consumers) demand less pollution WE must be willing to pay the price. This is not to say that industry has no responsibilities - of course it does.

In short, it is my contention that we all must become aware of our individual responsibilities (the collective one must follow), and that the best opportunity for this change of attitude is through the education process.

Your company can help by completing the enclosed questionnaire. Please understand that this information will be used in a responsible manner - and is intended to be used for the better education of our "soon to be voting" upper elementary and high school students.

Thank you for your time and assistance.

Sincerely yours,

John Dean Freund

John Dean Freund, Director

1. Company name _____
2. Address _____
3. Telephone number _____
4. Product(s) or Process(es) _____
5. Is your business that of a
   _____ Manufacturer
   _____ Supplier
   _____ Service
6. What industry(ies) uses your product? _____
7. Do you allow plant tours? Yes _____ No _____
   (If "no" do not proceed with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department_____ Position/Title _____
   Phone No. _____ Extension _____
9. Days tours may be taken _____
10. Hours tours may be taken _____
11. Days prior notice to arrange tour _____
12. Length of tour _____
13. Are tour guides available? _____ If "yes" how many? _____
14. Number of people in tour group: Minimum _____ Maximum _____
15. Indicate age groups which would profit by a visit to this service _____
16. Is it possible for the teacher to make a preliminary trip? _____
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed _____
    _____
    _____
18. Do you provide a brochure or information pamphlet for:
    _____ The teacher
    _____ Several for classroom and/or file use
    _____ Each student on tour
19. Are visitors allowed to take pictures? _____
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    _____
    _____
    _____
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
_____	air	_____
_____	water	_____
_____	mineral	_____
_____	chemical	_____
_____	biological (plant or animal material)	_____
_____	other	_____
_____	other	_____

22. Additional information
    _____
    _____
    _____
    _____

(If additional space is needed, use reverse side.)

SURVEY MAILING LIST FOR FIELDTRIP DIRECTORY

NAME OF COMPANY	REPLY - YES	REPLY - NO	NO ANSWER
1. Allied Plastics Corporation			X
2. Alton Box Board Company	X		
3. American Aggregates			X
4. American Bakeries			X
5. American Education Publications - XEROX	X		
6. American Zinc Company			X
7. Anderson Concrete Corporation	X		
8. Armstrong Furnace Company			X
9. Arrow Manufacturing Company			X
10. Art-Cast Inc.	X		
11. D. A. Auld Company			X
12. Barnett Paper Shredding Company			X
13. Borden Chemical Inc. - Cols. Coated		X	
14. Borden Chemical Inc. - Lustre Ware		X	
15. Borden Chemical Inc. - Smith Douglas			X
16. Buckeye Boxes Inc.			X
17. Buckeye Steel Castings Company		X	
18. Celanese Plastics Company	X		
19. Central Ohio Shredded Paper Company			X
20. Chase Foundry & Mfg. Company			X
21. Circleville Metal Works Inc.			X
22. Coca-Cola Bottling Company		X	
23. Columbia Gas of Ohio			X
24. Columbus Auto Parts Company			X
25. Columbus Canvas Products Inc.			X
26. Columbus Carton Company			X
27. Columbus Dispatch	X		
28. Columbus Forge Iron Company			X
29. Columbus Metal Company			X
30. Columbus Morse Rd. Water Treatment Plant	X		
31. Columbus Sanitation Landfill Plant			X
32. Columbus Sewage Treatment Plant	X		
33. Columbus & Southern Ohio Electric Company	X		
34. Container Corporation of America		X	
35. Continental Baking Company			X
36. Continental Can Company			X
37. Copco Papers Inc.			X
38. Crane Plastics Mfg. Company	X		
39. Cunard-Lang Concrete Company			X
40. CVI Corporation	X		
41. Delaware Clay Corporation			X
42. E I Du Pont De Nemours & Company			X
43. Duplex Printing Company			X
44. Evans Adhesive Corporation		X	
45. Federal Chemical Company		X	
46. Franklin Brass Foundry Inc.			X
47. Franklin Chemical Company			X
48. General Castings Company		X	
49. General Electric Company - Circleville			X
50. General Electric Company - Specialty Materials Dept.		X	

NAME OF COMPANY	REPLY - YES	REPLY - NO	NO ANSWER
51. Harmony Farms, Inc.			X
52. Harrop Ceramic Service Company			X
53. Highlights for Children Inc.		X	
54. Indian Springs Poultry Inc.			X
55. Industrial Aluminum Foundry Inc.			X
56. Industrial Ceramic Products Inc.		X	
57. Industrial Nucleonics Corporation			X
58. Industrial Platers Inc.			X
59. Jaeger Machine Company			X
60. Jeffrey Mining Machinery Company			X
61. Keever Company			X
62. Kentucky Fried Chicken			X
63. Lennox Industries Inc.			X
64. Marble Cliff Concrete Products Inc.			X
65. Marble Cliff Quarries Company	X		
66. Charles E. Merrill Publishing Company			X
67. Metal Forge Company			X
68. Minnesota Mining & Mfg. Company			X
69. National Graphics Corporation		X	
70. New Albany Mill		X	
71. New Century Company			X
72. New System Italian Bakery			X
73. Ohio Die Casting Corporation			X
74. Ohio Historical Society	X		
75. Ohio Malleable Iron Company			X
76. Ohio Packing Company		X	
77. Edward Orton Jr. Ceramic Foundation			X
78. Owens Illinois Inc.		X	
79. Pepsi Cola Bottling Company			X
80. Permacrete Products Corporation	X		
81. Quikrete Company			X
82. Ranco Inc.		X	
83. Resch's Bakery			X
84. Ross Laboratories			X
85. St. Regis Paper Company			X
86. Steward & Silver Inc.			X
87. Stim U Plant Laboratories Inc.			X
88. Swan Mfg. Company			X
89. Teeters Packing Company			X
90. Timken Roller Bearing Company			X
91. Twin Rivers Concrete Pots Company			X
92. Welch Plastics & Mfg. Company Inc.		X	
93. Harry Wellnitz Company		X	
94. Western Electric Company	X		
95. Westerville Meadow Gold Dairy			X
96. Westinghouse Electric Corporation		X	
97. White Plastics Company			X
98. Wilke Meats, Inc.			X
99. Worthington Foods Inc.		X	
100. Worthington Steel Company			X

Metropolitan Environmental Education Resources Study

1. Company name Alton Box Board Company - Paper tube Division
2. Address 4100 Lockbourne Rd., Columbus, Ohio 43207
3. Telephone number 491-5425
4. Product(s) or Process(es)
5. Is your business that of a

X	Manufacturer
	Supplier
	Service

6. What industry(ies) uses your product? Paper, Textile, Man made Fibers, Plastics
7. Do you allow plant tours? Yes X No
(If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
Department Position/Title General Manager
Phone No. 491-5425 Extension None
9. Days tours may be taken Monday - Friday
10. Hours tours may be taken 10:00 A.M. - 2:00 P.M.
11. Days prior notice to arrange tour 1 to 2 weeks
12. Length of tour 1 hour or less
13. Are tour guides available? Yes If "yes" how many? up to 4
14. Number of people in tour group: Minimum 1 Maximum 15
15. Indicate age groups which would profit by a visit to this service 12 & above
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed No special equipment. Adult supervision required. Normal Machinery precautions and forklift truck caution.
18. Do you provide a brochure or information pamphlet for:

X	The teacher
X	Several for classroom and/or file use
X	Each student on tour

19. Are visitors allowed to take pictures? Not at this time
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
The art of winding tubes, and the end use of our tubes would be of most interest. Collection at paper waste another.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	Compressed air for clutches, etc.
X	water	For cooling
X	mineral	Oils for lubricating
X	chemical	For glue make up
	biological (plant or animal material)	
	other	
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name American Education Publications - XEROX
2. Address 1250 Fairwood Avenue, Columbus, Ohio 43216
3. Telephone number 253-7471
4. Product(s) or Process(es) Publish Children's periodicals (MY WEEKLY READER, CURRENT EVENTS)
5. Is your business that of a

Printing	Manufacturer
	Supplier
	Service

6. What industry(ies) uses your product? Educational institutions; Schools, Kindergartens
7. Do you allow plant tours? Yes X No
(If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
Department Personnel-Betty Ruetsch Position/Title
Phone No. 253-7471 Extension 348 or 322
9. Days tours may be taken Tuesday through Friday
10. Hours tours may be taken Tours begin at 9:30 A.M. & 1:00 P.M.
11. Days prior notice to arrange tour 1 week
12. Length of tour 1 1/2 hours
13. Are tour guides available? Yes If "yes" how many?
14. Number of people in tour group: Minimum 10 Maximum 60
15. Indicate age groups which would profit by a visit to this service 6 to 70
16. Is it possible for the teacher to make a preliminary trip? yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed Tours are divided into groups of 12 to 15 in order that we can provide more individualized attention to each tourist. We try to make it a "learning experience."
18. Do you provide a brochure or information pamphlet for:

X	The teacher
X	Several for classroom and/or file use
X	Each student on tour

19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
To learn how a newspaper is prepared, printed and delivered. This is an opportunity to learn how and why so many different departments and people are required to publish MY WEEKLY READER.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	To dry ink on publications
X	water	Printing
	mineral	
X	chemical	Inks and drying process
X	biological (plant or animal material)	Paper used on the presses
Ink	other	Printing
	other	

22. Additional information
World's largest publisher of children's periodicals; 20 different weekly periodicals/ newspapers; over 16 million circulation. Largest customer of the U. S. Postal Service in Central Ohio.

(If additional space is needed, use reverse side.)

1. Company name Anderson Concrete Corporation
2. Address 400 Frank Road, Columbus, Ohio 43216
3. Telephone number 443-0123
4. Product(s) or Process(es) Ready Mixed Concrete
5. Is your business that of a

X	Manufacturer
X	Supplier
	Service

6. What industry(ies) uses your product? Construction
7. Do you allow plant tours? Yes X No
(If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) J. K. Smith,
Department Position/Title Personnel/Safety Dir.
Phone No. 443-0123 Extension 40
9. Days tours may be taken Prefer Tuesday or Thursday
10. Hours tours may be taken Start 10:00 A.M.
11. Days prior notice to arrange tour 7 to 10 days
12. Length of tour 1 to 1 1/2 hours
13. Are tour guides available? yes If "yes" how many? 1 (Concrete Eng.)
14. Number of people in tour group: Minimum 6-8 Maximum 10-12
15. Indicate age groups which would profit by a visit to this service 12-18
16. Is it possible for the teacher to make a preliminary trip?
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed None. Students must remain in the group, and not try to wander off for their own inspection tour, due to safety precautions.
18. Do you provide a brochure or information pamphlet for:

	The teacher
	Several for classroom and/or file use
	Each student on tour

Explanation of a Batcher Operation is verbal.

19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.) Inspection of a Batching Plant showing how concrete orders are received by teletype from central office, loading of the weigh hoppers with materials for the specific mix, discharge of materials into mixing drum and into the drum of transit mixer truck.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	All used in the manufacture of ready mixed
X	water	concrete are water, sand, gravel and cement.
X	mineral	In cold weather, calcium chloride is used
X	chemical	to speed the setting action of ready mixed
	biological (plant or animal material)	concrete.
	other	
	other	

22. Additional information
Since the space in our batching plant office is limited, groups must not be more than 10 to 12 people.

(If additional space is needed, use reverse side.)

1. Company name Art-Cast Inc.
2. Address 3130 Valleyview Drive, Columbus, Ohio 43204
3. Telephone number 226-2697
4. Product(s) or Process(es) Precast Concrete
5. Is your business that of a
   - X Manufacturer
   - Supplier
   - Service
6. What industry(ies) uses your product? Construction
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department Production Position/Title Ernest Davies, Product Manager
   Phone No. Extension
9. Days tours may be taken Monday through Friday
10. Hours tours may be taken 7:00 - 3:30 P.M.
11. Days prior notice to arrange tour 7
12. Length of tour Not organized - 1 hour would be long enough
13. Are tour guides available? If "yes" how many? 2 or 3 if necessary
14. Number of people in tour group: Minimum 2 Maximum 20
15. Indicate age groups which would profit by a visit to this service 10 & over
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    Follow directions - no special equipment
18. Do you provide a brochure or information pamphlet for:
    - NO The teacher
    - NO Several for classroom and/or file use
    - NO Each student on tour
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
	air	
X	water	Hydration of cement
X	mineral	Stone & sand for concrete strength
X	chemical	Retarders, admixtures in mixing & exposure process.
	biological (plant or animal material)	
	other	
	other	

22. Additional information
    Our plant is small and the process variable at different times of day. Certain things would be interesting to watch but a visit in advance by a teacher would be necessary to plan and evaluate.

Signed: R. A. Culver, President

(If additional space is needed, use reverse side.)

1. Company name Celanese Plastics Company
2. Address 4550 Cemetery Road, Hilliard, Ohio 43026
3. Telephone number 876-7371
4. Product(s) or Process(es) Plastic pipe fittings
5. Is your business that of a
   - X — Manufacturer
   - Supplier
   - Service
6. What industry(ies) uses your product? Residential Plumbing
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department Manufacturing Position/Title Manager, Manufacturing
   Phone No. 876-7371 Extension 232
9. Days tours may be taken As scheduled - not more than bi-monthly
10. Hours tours may be taken As scheduled
11. Days prior notice to arrange tour Month to 7 weeks
12. Length of tour 1 hour
13. Are tour guides available? Yes If "yes" how many? Depends on group size
14. Number of people in tour group: Minimum 5 Maximum 20
15. Indicate age groups which would profit by a visit to this service Jr.& High School
16. Is it possible for the teacher to make a preliminary trip? Yes, if scheduled
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed None
18. Do you provide a brochure or information pamphlet for:
    - No — The teacher
    - No — Several for classroom and/or file use
    - No — Each student on tour
19. Are visitors allowed to take pictures? Prefer not
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Automation of injection molding.
    Plastic pipe extrusion.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	Cooling and process control
X	water	Cooling
X	mineral	Raw material. ABS-Styrene-Polyethylene (mineral derived)
	chemical	
	biological (plant or animal material)	
	other	
	other	

22. Additional information

Signed: D. W. Baird, General Manager

(If additional space is needed, use reverse side.)

1. Company name Columbus Dispatch
2. Address 34 South Third Street, Columbus, Ohio 43216
3. Telephone number 461-5244
4. Product(s) or Process(es) Newspaper
5. Is your business that of a
   - X Manufacturer
   - X Supplier
   - Service
6. What industry(ies) uses your product? Community
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department Public Service Position/Title Tour Guides
   Phone No. 461-5244 Extension
9. Days tours may be taken Monday - Wednesday - Friday
10. Hours tours may be taken 9-11 A.M. 1-3 P.M.
11. Days prior notice to arrange tour one week
12. Length of tour one hour
13. Are tour guides available? Yes If "yes" how many? 3
14. Number of people in tour group: Minimum 12 Maximum 45
15. Indicate age groups which would profit by a visit to this service 6th grade & up.
16. Is it possible for the teacher to make a preliminary trip? No - see 22 (see 22.)
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed No special equipment.
    JUST BE ON TIME
18. Do you provide a brochure or information pamphlet for: Yes - a tour packet for every accompanying adult. Will send out ahead of time if specified.
    - The teacher
    - Several for classroom and/or file use
    - Each student on tour
19. Are visitors allowed to take pictures? No
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Press room, News room, Composing room
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
	air	
	water	
	mineral	
X	chemical	
	biological	
	(plant or animal material)	
Ink		
Paper	other	
Metal	other	

22. Additional information
    15. The age group begins at age 12 (no younger).
    16. A teacher may not make a preliminary trip, but the Dispatch has film to send out ahead which is explanatory. They call it their VIP film.

(If additional space is needed, use reverse side.)

1. Company name Columbus Morse Road Water Treatment Plant
2. Address 4250 Morse Rd., Gahanna, Ohio 43230
3. Telephone number 471-4252
4. Product(s) or Process(es) Process raw water into drinking water
5. Is your business that of a

	Manufacturer
X	Supplier
X	Service

6. What industry(ies) uses your product? Nearly all
7. Do you allow plant tours? Yes X No
(If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
Department Laboratory Position/Title Robert Corn - Water Treatment Plant Operator
Phone No. 471-4252 Extension
9. Days tours may be taken Tuesday, Wednesday, Thursday
10. Hours tours may be taken 8:00 A.M. - 3:00 P.M.
11. Days prior notice to arrange tour 2 to 3 weeks
12. Length of tour 1 1/2 hours
13. Are tour guides available? Yes If "yes" how many? 2
14. Number of people in tour group: Minimum Maximum 30
15. Indicate age groups which would profit by a visit to this service any age
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed Students stay in group and listen carefully to instructions.
18. Do you provide a brochure or information pamphlet for:

X	The teacher
X	Several for classroom and/or file use
X	Each student on tour

19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
The size of the plant and its equipment would be of interest to this age student as well as many phases of the water treatment process.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	Air used to run and control units
X	water	Raw material
X	mineral	Rapid sand used in filter system
X	chemical	Numerous chemicals used in purification process, such as - alum, lime, soda ash, chlorine, calgon
	biological (plant or animal material)	
Gas	other	Gas used for recarbonization process
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name Columbus Southerly Waste Water Treatment Plant
2. Address 6977 South High St., Box 95C, Rt. #1, Lockbourne, Ohio 43137
3. Telephone number 491-4413
4. Product(s) or Process(es) Activated sludge treatment of sewage.
5. Is your business that of a

	Manufacturer
	Supplier
X	Service

6. What industry(ies) uses your product? Columbus Metropolitan area
7. Do you allow plant tours? Yes X No
(If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
Department Sewage & Drainage Position/Title Mary Pike, Secretary
Phone No. 491-4413 Extension
9. Days tours may be taken Usually any day
10. Hours tours may be taken Usually any time except after dark
11. Days prior notice to arrange tour Varies - recommend at least one week
12. Length of tour 2 - 4 hours
13. Are tour guides available? Yes If "yes" how many? Varies
14. Number of people in tour group: Minimum None Maximum Varies with age
15. Indicate age groups which would profit by a visit to this service 4th grade & up
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed NONE
18. Do you provide a brochure or information pamphlet for:

Yes	The teacher
Yes	Several for classroom and/or file use
	Each student on tour

19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
Settling tanks, aeration tanks, filters, incinerators, tunnels.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	Aeration of sewage
X	water	Flushing & cleaning
X	mineral	Gas & oil for incineration & heating digesters
X	chemical	Polymer for filtration, Chlorine for disinfection
X	biological (plant or animal material)	Organisms in activated sludge consume organic matter in sewage
	other	
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name Columbus & Southern Ohio Electric Company
2. Address 215 North Front Street, Columbus, Ohio 43215
3. Telephone number 228-6411
4. Product(s) or Process(es) Electric utility
5. Is your business that of a
   - ____ Manufacturer
   - ____ Supplier
   - X Electricity Service
6. What industry(ies) uses your product? All
7. Do you allow plant tours? Yes X No ____
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) Ronald G. McDade, Supervisor
   Department Public Relations Position/Title Educational Activities
   Phone No. 228-6411 Extension 366
9. Days tours may be taken Monday through Friday
10. Hours tours may be taken 8:00 A.M. - 5:00 P.M.
11. Days prior notice to arrange tour Approximately 2 weeks
12. Length of tour 1 to 1 1/2 hours
13. Are tour guides available? Yes If "yes" how many? As necessary
14. Number of people in tour group: Minimum 15 Maximum 30
15. Indicate age groups which would profit by a visit to this service Jr. High & above
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    Dress in sport or casual clothing
18. Do you provide a brochure or information pamphlet for:
    - Yes The teacher
    - Yes Several for classroom and/or file use
    - ____ Each student on tour
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Generating Station & Coal Fields
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	Combustion
X	water	Cooling & Steam
	mineral	Coal & Oil or Natural Gas
	chemical	
	biological (plant or animal material)	
	other	
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name Crane Plastics Manufacturing Company
2. Address 2141 Fairwood Avenue, Columbus, Ohio 43207
3. Telephone number 443-4891
4. Product(s) or Process(es) Custom Profile Extrusions
5. Is your business that of a
   X Plastics Manufacturer
   Supplier
   Service
6. What industry(ies) uses your product? Home Building
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department Personnel Position/Title Mr. Zikas, Director of Personnel
   Phone No. 443-4891 Extension
9. Days tours may be taken By appointment
10. Hours tours may be taken By appointment
11. Days prior notice to arrange tour To be arranged
12. Length of tour 1 hour
13. Are tour guides available? Yes If "yes" how many? 2
14. Number of people in tour group: Minimum 5 Maximum 20
15. Indicate age groups which would profit by a visit to this service varies
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    Normal safety awareness
18. Do you provide a brochure or information pamphlet for:
    Yes The teacher
    Yes Several for classroom and/or file use
    No Each student on tour
19. Are visitors allowed to take pictures? Possibly
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Extrusion process and related cut-off and fabrication equipment
21. Check the list of natural resources that are used in any aspect of production of your facilities.

	Natural Resources	Use
X	air	Cooling Extrusions
X	water	Cooling Extrusions
	mineral	
X	chemical	Raw Materials
	biological (plant or animal material)	
	other	
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name CVI Corporation
2. Address P.O. Box 2138, Columbus, Ohio 43216
3. Telephone number 876-7381
4. Product(s) or Process(es) Nuclear Plant Gas Cleanup. Cryogenic Purification.
5. Is your business that of a
   - X Manufacturer
   - Supplier
   - Service
6. What industry(ies) uses your product? Nuclear Power, Aerospace
7. Do you allow plant tours? Yes On a restricted basis No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) George D. Kannapel
   Department Sales Position/Title Manager of Sales
   Phone No. 876-7381 Extension X 223
9. Days tours may be taken No standard tour arrangements made
10. Hours tours may be taken Based on what there is to see. Best after 5:00 P.M.
11. Days prior notice to arrange tour 1 week
12. Length of tour Varies up to 1 hour
13. Are tour guides available? yes as necessary If "yes" how many?
14. Number of people in tour group: Minimum ----- Maximum -----
15. Indicate age groups which would profit by a visit to this service
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    None
18. Do you provide a brochure or information pamphlet for:
    - The teacher
    - Several for classroom and/or file use
    - Each student on tour

    No - only standard catalog information.
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Cryogenic applications.
    Liquid Nitrogen demonstration.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

	Natural Resources	Use
	air	
	water	
	mineral	
	chemical	
	biological (plant or animal material)	
	other	
	other	

22. Additional information
    CVI designs and manufactures specialized equipment and systems.
    CVI is a large metal fabrication type shop. We have no production line operations. Shop is relatively clean at most times.

(If additional space is needed, use reverse side.)

1. Company name Marble Cliff Quarries Company
2. Address Office: 2100 Tremont Center, Columbus, Ohio 43221, (Quarry: 3135 Trabue Rd.
3. Telephone number 486-5251 Columbus, Ohio)
4. Product(s) or Process(es) Crushed Limestone
5. Is your business that of a
   - X Manufacturer
   - X Supplier
   - Service
6. What industry(ies) uses your product? Construction, Agriculture
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) Max Warner, J.O. Leonard
   Department Quarry Position/Title Geologists
   Phone No. 486-5251 Extension 273
9. Days tours may be taken Monday through Friday
10. Hours tours may be taken 9:00 A.M. - 4:00 P.M.
11. Days prior notice to arrange tour 7
12. Length of tour 1 to 2 hours
13. Are tour guides available? Yes If "yes" how many? 1 or 2
14. Number of people in tour group: Minimum 5 Maximum 30
15. Indicate age groups which would profit by a visit to this service 10-60
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed No horseplay, obey instructions. Appropriate clothing and strong shoes.
    Rock hammers and safety goggles.
18. Do you provide a brochure or information pamphlet for: NO
    - The teacher
    - Several for classroom and/or file use
    - Each student on tour
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Drilling and blasting, loading and processing of Limestone.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

	Natural Resources	Use
	air	
X	water	Washing rock
X	mineral	Source material
	chemical	
	biological (plant or animal material)	
	other	
	other	

22. Additional information
    Fossil collecting, Geological information.

(If additional space is needed, use reverse side.)

1. Company name Ohio Historical Society
2. Address 1982 Velma Avenue, Columbus, Ohio 43211
3. Telephone number 469-4722
4. Product(s) or Process(es)
5. Is your business that of a
   ___ Manufacturer
   ___ Supplier
   X Museum
   ___ Service
6. What industry(ies) uses your product?
7. Do you allow plant tours? Yes X No ___
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) Tom D. Crouch,
   Department Education Position/Title Supervisor of Education
   Phone No. 469-4722 Extension ___
9. Days tours may be taken (Mon-Fri/open 9-5) (Sat 1-5) (Sun 1-5, but no tours given)
10. Hours tours may be taken 9-5
11. Days prior notice to arrange tour At least two weeks
12. Length of tour 1 1/2 hours
13. Are tour guides available? Yes If "yes" how many? ___
14. Number of people in tour group: Minimum 20 Maximum 30 (larger groups broken
15. Indicate age groups which would profit by a visit to this service 4th gr.-adult. down)
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
18. Do you provide a brochure or information pamphlet for:
    ___ The teacher
    ___ Several for classroom and/or file use
    ___ Each student on tour
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    Exhibit areas include presentations of Ohio Natural History, Archaeology and History.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
___	air	
___	water	
___	mineral	
___	chemical	
___	biological (plant or animal material)	
___	other	
___	other	

22. Additional information
    While we do not fit the criteria mentioned in your cover letter, we do have much to offer the student of environmental problems. Our natural history is particularly useful in this regard. There is also much information available in the archaeology area on the Indian's relationship to his micro-environment.

(If additional space is needed, use reverse side.)

1. Company name Permacrete Products Corporation
2. Address 1839 South Wall Street, Columbus, Ohio 43207
3. Telephone number 444-9040
4. Product(s) or Process(es) Pre-cast concrete
5. Is your business that of a
   X Manufacturer
   Supplier
   Service
6. What industry(ies) uses your product? Railroads & Cemeteries
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments) Frank Campbell,
   Department Position/Title General Superintendent
   Phone No. 444-9040 Extension
9. Days tours may be taken Any week day
10. Hours tours may be taken 7:00 - 11:00 A.M. & 11:30 A.M. - 3:30 P.M.
11. Days prior notice to arrange tour 1 week
12. Length of tour 1 hour
13. Are tour guides available? Yes If "yes" how many? 1
14. Number of people in tour group: Minimum Maximum
15. Indicate age groups which would profit by a visit to this service 16 yrs. up
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    None
18. Do you provide a brochure or information pamphlet for:
    No The teacher
    No Several for classroom and/or file use
    No Each student on tour
19. Are visitors allowed to take pictures? Yes
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
21. Check the list of natural resources that are used in any aspect of production of your facilities.

	Natural Resources	Use
X	air	
X	water	
X	mineral	
X	chemical	
	biological (plant or animal material)	
	other	
	other	

22. Additional information

(If additional space is needed, use reverse side.)

1. Company name Western Electric Company - Columbus Works
2. Address 6200 East Broad Street, Columbus, Ohio 43213
3. Telephone number 868-2000
4. Product(s) or Process(es)
5. Is your business that of a
   - X Manufacturer
   - X Supplier
   - X Service
6. What industry(ies) uses your product? Telephone Communication Industry
7. Do you allow plant tours? Yes X No
   (If "no" do not process with remaining questions. Please return in accompanying envelope)
8. Name of contact (for tour appointments)
   Department 822 Position/Title Public Relations Associate
   Phone No. 868-3418 Extension
9. Days tours may be taken Monday through Friday
10. Hours tours may be taken 9:00 A.M. - 11:30 A.M. 1:00 P.M. - 3:00 P.M.
11. Days prior notice to arrange tour 3 weeks
12. Length of tour 1 1/2 hours
13. Are tour guides available? Yes If "yes" how many? as needed
14. Number of people in tour group: Minimum 5 Maximum By arrangement
15. Indicate age groups which would profit by a visit to this service 11th grade & up
16. Is it possible for the teacher to make a preliminary trip? Yes
17. What special instructions are necessary for visitors? Specify cautions which need to be taken. Indicate special equipment needed
    Observe safety precautions and directions by tour guide.
18. Do you provide a brochure or information pamphlet for:
    - Yes The teacher
    - Yes Several for classroom and/or file use
    - Yes Each student on tour
19. Are visitors allowed to take pictures? No
20. Briefly list facility features which might be of special interest (try to visualize your facility through the eyes of a 12-16 year old.)
    People at work - modern manufacturing processes, physical layout of a manufacturing system and its support facilities.
21. Check the list of natural resources that are used in any aspect of production of your facilities.

Natural Resources		Use
X	air	All manufacturing processes make use of one or more of these basic components.
X	water	
X	mineral	
X	chemical	
X	biological (plant or animal material)	
	other	
	other	

22. Additional information
    Of the 104 known chemical elements, 97 are used by Western Electric in its manufacturing work for the Bell System.

(If additional space is needed, use reverse side.)

unit materials

THE UNIT MATERIALS

Four fieldtrips were chosen at the outset of the study to allow adequate time in the design, preparation, and printing of the student materials. These materials included a critical thinking unit and fieldtrip observation sheets. The fieldtrip sites were: (1) a brick manufacturing plant, (2) an electric generating plant, (3) a water treatment plant, and (4), a waste water treatment plant. Two essential elements of the material design are the five observation categories and its open ended design. As the study began to take shape, it was decided to buy six simple cameras and two inexpensive tape-recorders. These pieces of equipment were purchased so that the students would have some basic observation tools with which to work when they made their fieldtrip(s).

Critical Thinking & Decision-making Today was designed as an attempt to answer one of the dilemmas that has always confronted teachers, viz., that of teaching fact, or stressing abilities in critical thinking and decision-making. Six steps to critical thinking were adapted from a unit by the Beacon Press, and were used as a suggested step-by-step procedure for arriving at a logical decision by way of critical thinking. In a sense, this is the social studies or psychology counterpart to the scientific method. The format design relied heavily on the use of current cartoons with a definite environmental bias. Brief instructions accompanied the cartoon, with the general idea in mind that the student would respond to the cartoon as a thought stimuli. Besides the cartoon format, a reproduction of an advertisement was used as well as newspaper articles which gave both sides of an environmental issue.

The student materials and the objectives of the study were explained to each of the six, fifth grade teaching teams in separate team meetings.

While a workshop would have been the most efficient method of introducing the materials and objectives, time did not permit this approach. Instead, each teacher was given a community study outline prepared by Don Bosworth and entitled Our Own Community. In a brief introduction Bosworth states the purpose of the unit outline in the following way - "The purpose of this unit is to thoroughly acquaint the students with the community in which they live. They accomplish this by actually creating a community of their own choice and design. They draw upon their own knowledge and experiences to construct their own community."

The teachers were also furnished with reprints of two articles which appeared in The Journal of Environmental Education. The first article, by Edward A. Ames is entitled "Schools and the Environment." In it the author looks at the relationship of the school curriculum and the environment as a unit of study. He also makes numerous suggestions about re-structuring the school and classroom organization to facilitate a more relevant and open approach to teaching. The following quotation is an excellent summary of the article. "In effect they [schools] must teach through the environment using the community as a source of learning experiences rather than about the environment as a generalized object of study. Furthermore, if schools are to effect the behaviour of children in order to moderate society's impact on the environment they must lead students to explore the social interactions and the whole system of human values, concerns, and assumptions which underlie our behaviour." [The italic type in the reprint is by the author of this study.] The second article, by R. Thomas Tanner is entitled "Environmental Sensitivity and the Mass Media." The author recognizes that teachers use "the mass media as a vehicle for instruction" in many areas. With this basic assumption he suggests that examples from the media be used to illustrate the many "environmental incongruities" that occur in most advertising.

He gives several examples where a narrator is in the irrational position of "taking both sides" of an issue. He then suggests that the news be structured to - (1) deal with essential trends not just immediate events or isolated episodes, (2) direct more attention to environmental legislation and the voting record of our legislators, and (3) improve public awareness of state and regional issues. Tanner, like Ames, identifies the problem as - " . . . population growth in combination with economic growth, along with the persistence of value systems which actively promote or passively condone these social and economic phenomena." Thus, these two articles summarize the author's position on at least three basic phases of this study, viz., (1) how environmental studies should be conceptualized, (2) where environmental studies should be carried out, and (3), some of the methods which should be used in environmental studies.

In addition, the teachers were each given a copy of two books which detail the problems of the environment in easy to understand, non-technical language. They were - National Environment Test and Everyone's Guide to Ecological Living. These materials were given to the teachers in an effort to provide them with some input materials without dictating specific items to be taught, while at the same time trying to maintain the open-ended design of the materials. The teacher's copy of the materials included a road map from which the unit maps illustrating the major streams of the Columbus Metropolitan and Central Ohio area were synthesized, and a page entitled "Observation Sheets: Teacher Instructions/Suggested Questions." This page includes the basic instructions for using the observation sheets and five observation categories each with a set of suggested questions. The five observation categories are - natural resources, production use of natural resource(s), the product, by-products (especially wastes), and conservation.

These categories were chosen in an attempt to force the student, through firsthand observations, to use a more thorough method of analyzing a situation. Until recently, studies of the use of our natural resources have emphasized the engineering and technological accomplishments that made possible massive extraction of those natural resources. In addition, we have studied intensively the production processes. Our interest in the actual natural resource(s) has been characterized by making a listing of the particular natural resources needed in a specific production process. In short, our analysis has been process oriented without giving adequate attention to the far ranging impact of all of those actions that are required to produce some economically desireable product. As a consequence we suddenly realize that we have not given adequate attention to - (1) the impact on the environment resulting from the extraction process, (2) the impact of the mass production process on the worker, (3) the massive quantities of by-products (until recently the term "by-product" was just a nice management word for waste) being generated by the production process, and (4), the impact of the product itself on the buying public. In spite of the obvious bias expressed above, it is still essential that the students have the opportunity to arrive at their own conclusions. Certainly materials must be prepared, and categories may be selected and presented to the students as study tools - but the materials and categories must be broad enough and open-ended enough to allow the students' conclusions to be their own.

The next step is to give my definition of the term open-ended. Of course the design of any material in some way dictates the way in which it is used. To overcome this problem, these materials were constructed so as to optimize the interests and the background of both the teacher and students. In short, an area of study is suggested and then the research of factual

materials and the details of the study method are left in the collective hands of the teacher and the students. The input of factual material regarding specific problems of the environment was provided by means of the two books mentioned above. This same open-ended design is a part of the student's observation sheets, which also place great emphasis on the experiences and resources of the study participants - both teachers and students.

METHOD

Through the tests which were given to the children it was discovered that 97% of them had had some form of outdoor education experiences as part of either their third or fourth grade classes. Even so, it was assumed that the background of the children was varied because of the varied interests of their classroom teachers. As a result, it was decided to create a uniform "starting point" for all of the fifth grade students. This was accomplished by bringing together a slide unit entitled Now It Needs Us, and the unit materials sponsored by the Continental Can Company entitled Environmental Action: No Time To Waste.

The environmental awareness unit entitled Now It Needs Us, was prepared cooperately by Mr. James Westwater and the Ohio Department of Natural Resources for presentation at the 1971 Ohio State Fair in Columbus, Ohio. Mr. Westwater is a PhD. candidate in the College of Education at the Ohio State University. This unit utilized the most current multi-screen techniques. Four sets of slides were shown simultaneously with a synchronized tape narrative. Westwater's technique was to contrast the sights and sounds of "unspoiled" nature against the sights and sounds of "progress" as characterized by our urban environment. This presentation was given for all of the fifth grade students after the pre-test was administered.

A brief subjective evaluation of the slide unit, made among several fifth grade teachers, indicated that the slides had a great deal of impact and were very well received by the children. However, one fifth grader commented after the slide presentation, "Kids our age have heard about this problem before, why don't you tell the adults about it?"

The development of the environmental problems unit entitled Environmental Action: No Time To Waste was sponsored by the Continental Can Company. It consists of a film strip, a record which includes the narrative for the film strip and several environmental folk songs, a game created to stimulate environmental awareness, a copy of the student workbook, and a teacher's manual. With the assistance of the manager of the local Continental Can Company plant, the study was able to secure six of the unit kits and nearly 600 of the student workbooks - all of them without cost. As a result, one kit and enough workbooks for each fifth grader were given to each participating elementary school. As with the fieldtrips, the classroom teacher was left with the option to use these materials or not to use them.

The remaining pages in this section comprise a tabulation entitled - "Metropolitan Environmental Education Resources Study - Book Recipients". As the title indicates, it is a listing of those people who received the initial printed materials produced for this study. That initial set of materials included: (1) an introduction and instruction sheet; (2) the unit entitled Critical Thinking & Decision-Making Today; (3) "Observation Sheets: Teacher Instructions/Suggested Questions;" (4) the set of observation sheets for - the Brick Manufacturing Plant, the Morse Road Water Treatment Plant, the Southerly Waste Water Treatment Plant and the Electric Generating Plant (including the "Major Polluters' Inventory Checklist") respectively; and

(5), the two reprints entitled "Schools and The Environment" and "Environmental Sensitivity and The Mass Media."

A total of one hundred and two (102) books were distributed during the study period. A breakdown follows:

	40	- Worthington City Schools
	14	- Westerville City Schools
	6	- Grandview City Schools
	42	- Miscellaneous
Total	102	

In addition, a similar set of materials was given to a total of two hundred and ninety-four (294) students who actually visited any one of the four fieldtrip study sites. (The student materials did not include - the introduction and instruction sheet, the "Observation Sheets: Teacher Instructions/Suggested Questions," or the reprints.)

Finally, two hundred of the teacher materials are included in this final report. Thus, the total number of unit materials which will have been distributed at the completion of the written report and its dissemination will amount to nearly six hundred (600) copies.

METROPOLITAN ENVIRONMENTAL EDUCATION RESOURCES STUDY

BOOK RECIPIENTS

WORTHINGTON SCHOOLS

All Fifth Grade Teachers (participated in the Study)

Brookside Elementary School - 6700 McVey Blvd., Worthington, Ohio
- Marilyn Axtmann
- Dorothy Ford
- Susan Zimmerman

Colonial Hills Elementary School - 5800 Greenwich Street, Worthington, Ohio
- Diane Langner
- Cathy Muzilla
- Donald T. White

Evening Street Elementary School - 885 Evening Street, Worthington, Ohio
- Linda Foster
- David Hall
- Margaret Parks

Wilson Hill Elementary School - 6500 Northland Road, Worthington, Ohio
- Donna Iden
- Nannie Lou Johnson
- Clara Smeltzer
- Penny Ury

Worthington Estates Elementary School - 6760 Rieber Street, Worthington, Ohio
- Leah Hawkins
- Charles Howell
- Patricia MacCleary
- Carol Radnor

Worthington Hills Elementary School - 1221 Candlewood Drive, Worthington, Ohio
- Virginia McDougle
- W. Eugene Putterbaugh
- Judy Williams
- Kathy Broom

Additional Worthington Schools Staff
- H. C. McCord - Superintendent
- Walter F. Blume - Assistant Superintendent for Business
- Ralph Wilson - Director of Elementary Instruction
- Earl W. Lane - Assistant Superintendent for Instruction
- David M. Polk - Director of School-Community Relations
- Robert Hill - Biology, High School
- James Immelt - Biology, High School (9th grade)
- Diane Karlovec - Geo./W. History, High School (9th grade)
- Herbert Linzell - Earth Studies, (9th grade)
- Robert McBurney - Biology/Science Coordinator, High School
- Roger Pinnicks - Biology, High School

WORTHINGTON SCHOOLS

Additional Worthington Schools Staff
Lindsey Chesbrough - Special Education, Perry Middle School
Rose Shepard - Special Education, Perry Middle School
Arnold Skidmore - Science, Perry Middle School
Dorothy Myers - Special Education, Evening Street Elementary School
Kathy Logan - 6th Grade, Worthington Hills Elementary School
Young People's Librarian - High School
Tony Danna - Printer, Print Shop
Donna Ebright - Special Education, Wilson Hill Elementary School

MISCELLANEOUS

Grandview Heights City Schools
Board of Education - 1587 West Third Ave., Columbus, Ohio 43212
Senior High School - 1587 West Third Ave., Columbus, Ohio 43212
Junior High School - 1240 Oakland Ave., Columbus, Ohio 43212
Edison Elementary School - 1241 Fairview Ave., Columbus, Ohio 43212
Robert Louis Stevenson Elementary School - Oxley Rd., & West First Ave., Columbus, Ohio 43212

Westerville City Schools
Board of Education - 303 South Otterbein Ave., Westerville, Ohio 43081
Senior High School - 303 South Otterbein Ave., Westerville, Ohio 43081
Blendon Junior High School - 223 South Otterbein Ave., Westerville, Ohio 43081
Walnut Springs Junior High School - 3289 E. Walnut St., Westerville, Ohio 43081
Annehurst Village Elementary School - 925 W. Main St., Westerville, Ohio 43081
Central College Elementary School - 7053 Sunbury Rd., Westerville, Ohio 43081
Cherrington Elementary School - 522 Cherrington Rd., Westerville, Ohio 43081
Emerson Elementary School - 44 No. Vine St., Westerville, Ohio 43081
Hanby Elementary School - So. State & E. Park Streets, Westerville, Ohio 43081
Hawthorne Elementary School - 3150 Minerva Lake Rd., Westerville, Ohio 43081
Huber Ridge Elementary School - 5757 Buenos Aires Blvd., Westerville, Ohio 43081
Longfellow Elementary School - Hiawatha Ave., Westerville, Ohio 43081
Minerva Elementary School - 5184 Cleveland Ave., Westerville, Ohio 43229
Whittier Elementary School - 130 E. Walnut St., Westerville, Ohio 43081

St. Paul's School - 61 Moss Rd., Westerville, Ohio 43081
St. Michael's School - 64 E. Selby Blvd., Worthington, Ohio 43085
Ned Mosher - Westerville Outdoor Education Teacher
Ronald McDade - Education Supervisor of Public Relations Dept., Columbus & Southern Ohio Electric Co., 215 No. Front St., Columbus, Ohio 43215
James Westwater - 2371 Bexley Park Rd., Columbus, Ohio 43209 (presented Multi-image presentation: Introduction To Environmental Awareness, Now It Needs Us to Worthington Fifth Grade Students participating in the Environmental Study) (candidate Ph.D., O.S.U. Envir. Ed.)
Carolyn Valentine - Freshman Early Experience student for Ralph Wilson, Director of Worthington Elementary Instruction
Ruth Melvin - Ohio Academy of Science, 445 King Ave., Columbus, Ohio 43201
Ben Bohl - 34 Sheffield Rd., Columbus, Ohio 43214 (Director of International Field Studies, Ph.D. candidate in Environmental Education, O.S.U., participated in Metropolitan Environmental Education Resources Study)
Sue Cheallaro - Teacher, Avery Rd., Elementary School, Hilliard, Ohio 43026
Tom Crook - Teacher, Hilliard Elementary School, Hilliard, Ohio 43026

MISCELLANEOUS

Sara McKinley - 6th Grade Teacher, Salem Elementary School, 1040 Garver Rd., Columbus, Ohio 43229

Eugene Knight - Supervisor, Conservation & Environmental Education, State Dept. of Education, Div. Elementary & Secondary Education, State Office Building, Columbus, Ohio 43215

Eleanor C. Rose - Shaker Heights High School Teacher, 15911 Aldersyde Drive, Shaker Heights, Ohio 44120

Jerry Dunlop - Director of Outdoor Education, Ashland City Schools, 1147 Westview Rd., Ashland, Ohio 44805

Peter Metro - Rocky River Board of Education, 2985 Wooster Rd., Rocky River, Ohio 44116

Dennis Wint - Director, Center for the Development of Environmental Curriculum, 2705 River Rd., Willoughby Hills, Ohio 44094

Dr. Robert Arnold - Environmental Health Division, Franklin County Health Dept., Columbus, Ohio 43215

Dr. Charles Mann - Physical Education Dept., O.S.U., 337 W. 17th Ave., Columbus, Ohio 43210

Bernie Cellar - Education Dept., Capital University, 2199 E. Main St., Columbus, Ohio 43209

Virginia Earl - O.S.U. student, 222 West Lane Ave., Columbus, Ohio 43210

Mrs. E. Chasaz - 2632 Foxwood, Akron, Ohio 44313

Bill Williams - O.S.U. student

Charles E. Brown - Leipsic Local School Superintendent, 232 Oak St., Leipsic, Ohio 45856

John L. Johnson - Assistant Superintendent, Napoleon City Schools, 211 West Main St., Napoleon, Ohio 43545

Donald McIlroy - Public Relations Director, Lorain County Schools, 420 W. 3rd. St., Elyria, Ohio 44035

Lowell J. Petry - Board of Education, Dayton, Ohio 45402

Jerri Peterman - Teacher, Westerville City Schools, Westerville, Ohio 43081

Jim Gould - Teacher, Westerville City Schools, Westerville, Ohio 43081

Linda Levstik - Teacher, Columbus Torah Academy, 2767 E. Broad St., Columbus, Ohio 43209

Joel Zeigler - Teacher, Grandview Senior High School, 1587 W. Third Ave., Columbus, Ohio 43212

Marilyn Sauder - c/o Dorothy Pavkov, 9729 Syman Way, Upper Marlboro, Maryland 20870

Frank W. McCain - Teacher, Big Walnut Middle School, Sunbury, Ohio 43074

Dr. Robert E. Roth - School of Natural Resources, O.S.U., 224 Lord Hall, 124 W. 17th Ave., Columbus, Ohio 43210

William Stapp - Chairman, Environmental Education, School of Natural Resources, University of Michigan, Ann Arbor, Michigan 48104

Dr. Malcolm D. Swan - Dept. of Outdoor Teacher Education, Northern Illinois University, Lorado Taft Field House, Oregon, Illinois 61061

Clifford Knapp - Outdoor Education Center, Southern Illinois University, Carbondale, Illinois 62901

Jerry Elliott - 263 Recreation Building, University Park, Pennsylvania 16802

Andy Ball - Freshman Early Experience Student, O.S.U., working with the Worthington Outdoor Education Department, Fall Quarter, 1972.

Pat Barron - Student, O.S.U.

Mike Jones - Graduate student, University of Michigan, Ann Arbor, Michigan 48104

Angela Fasone - Teacher, St. Paul's School, 61 Moss Rd., Westerville, Ohio 43081

Donna Szhuy - Environmental Education Coordinator, Ohio Department of Natural Resources, Room 222, Bldg., 6, Fountain Square, Morse Rd., Columbus, Ohio 43224

CRITICAL THINKING & DECISION-MAKING TODAY

This set of materials was prepared for your use during the Metropolitan Environmental Education Resources Study (MEERS). It has two parts; the first part "Critical Thinking & Decision-Making Today," is intended to make students aware of the importance of individual decisions and the impact on our surroundings. ("Schools and the Environment," by Edward A. Ames is included because it expresses very thoroughly, many of my own fundamental reasons for the study and its general design. Emphasis by means of italicized print is my own.) This unit has five parts. They are; (1) an introduction (including some ideas about decision-making and some appropriate questions), (2) cartoons A through C (note code in lower left-hand corner) will help draw attention to the environmental problem and give you a chance to see what the students know and think and feel about this situation, (3) cartoons D and E are intended to raise value questions about "progress" as we now know it, (4) cartoons F and G should help the student become more aware of man's place in an ecological context, and (5), sheets H through J should draw attention to forms of communication and information bias. (See "Environmental Sensitivity and the Mass Media," by R. Thomas Tanner which is also included for your use.)

In addition, do not hesitate to discuss with your students my biases in the materials I present and the way they are structured. If the idea of questioning information sources is a valid premise, then you should question these materials too!

OBSERVATION SHEETS

The core of the second part is a series of observation sheets to be used with the four fieldtrips, i.e., the brick manufacturing plant (no code number), water treatment plant (No. 2), waste water treatment plant (No. 3), and the electric generating plant (No. 4). It should be noted that with the exception of the diagrams, the observation sheets could be used in any situation where there is; a natural resource(s), a use of that natural resource, a production process, a product, a by-product (especially wastes), and the potential for a wiser use of the natural resource(s) involved.

In addition there is a sheet entitled "Observation Sheets: Teacher Instructions/Suggested Questions." It is just that.

The worksheet (No. 1) with the map of central Ohio and twenty-three questions should be used prior to visiting both the water treatment plant and the waste water treatment plant. A map, from which the sketch map on the worksheet was taken, is included in the manila envelope on the back cover of this booklet. It will be helpful because it is larger and the features are indicated in color. The worksheet entitled "The Major Polluters' Inventory Checklist," should precede the trip to the electric generating plant.

The "Glossary of Environmental Terms," should accompany each of the sets of observation sheets. This sheet should be close at hand so the student will have an opportunity to record and learn new words that are immediately relevant.

All of these materials were intentionally designed to be as open-ended as possible. I assume we all know there is at least a need for a greater environmental awareness. But, since specific environmental problems vary from state to state - our first concern should be about local problems and their solution. Our knowledge of the problem(s) should be based on observation and first-hand experience whenever possible. Consequently, we all need greater skills in observation, critical thinking and decision-making. And once a course of action has been suggested, we must then be willing to be involved in that action.

HOW MANY? HOW DO I GET THEM?

There are enough "Critical Thinking & Decision-Making Today" units for every fifth grade student. There are also enough fieldtrip observation sheets, as outlined above, for each student, for all four (4) fieldtrips. All materials are available on request. Simply call 888-0357.

THINGS TO REMEMBER

Remember - as you take your fieldtrip(s) that six (6) Instamatic cameras and two (2) taperecorders are available for your students' use. Film and processing will be available as long as funds last. Also keep in mind the books about the environmental problems and environmental action that you were given earlier in the study.

YOUR OPTION

You have a number of options. You may wish to use only the unit "No Time To Waste" and the "Critical Thinking & Decision-Making Today," unit, and take none of the fieldtrips. You may wish to take 1, 2, 3, or 4 fieldtrips and use all of the materials available. While I obviously want to see the Study succeed, I also want you to be assured that the options are yours.

OUR SINGLE BIGGEST PROBLEM

Yes, we have a problem. The four fieldtrip locations and their staffs have been very kind in helping work out the details of these trips. However, there is a limit to the number of students that can be taken through a field-trip site at one time. In the case of the four proposed fieldtrips, the number that can safely and economically be "toured" at one time is about thirty (30). This means that the participating teachers (those wishing to go on the fieldtrips) will have to make attitudinal adjustments and scheduling adjustments. If this can be done, there is no problem.

TRANSPORTATION

Even though we have customarily taken the entire team on outdoor education fieldtrips, this will not be a great problem with these fieldtrips because they are largely indoors and therefore will be essentially the same each time, regardless of the weather. I have been assured that the small size of the group will not create any insurmountable problem for this particular study.

FINISHING UP

All fieldtrips for the study should be completed by the end of April. This is necessary to allow adequate time for the post-test to be administered, and also to allow time for the computer work and statistical study.

ANY QUESTIONS?

Please call the Metropolitan Environmental Education Resources Study at the Worthington Outdoor Education Department (614) 888-0357. Thank you for your cooperation.

critical thinking & decision - making

THE THINKER

from: Environmental Action, Vol.1, No.5, March 19, 1970, p.5.

TODAY

prepared by: John Dean Freund
Worthington City Schools
Outdoor Education Department,
through funds provided by the
Martha Holden Jennings Foundation,
Cleveland, Ohio.

INFORMATION PLEASE!

- Do we all make the same decision about the same problem?
- Do we all have the same background and experience on which we can make a decision?
- Do we all do things (including decision-making) for the same reason?
- Do we make a decision without any outside help at all?

If we receive outside help, what can we do to make sure our decision is at least a thoughtful, responsible one, even if it is not 100% our own?

1. *Critically examine the information we receive.*
   WHAT are we being told? WHO is giving us the information and WHY?

2. *Recognize self-deception.* [deceive, v., 1. make (a person) believe as true something that is false; mislead. 2. lie; use deceit.]
   Can we really make ourselves believe a lie?

3. *Order [or arrange] one's values.* [values, - ideals, customs, institutions, etc., of a society toward which the people of the group have an emotional feeling. Values may be positive or negative.]
   Can you think of some values? Can you think of any values that have to do with the environment?

4. *Identify the source of values and evaluate or rate them in order of importance.*
   Try making a list of values and their source(s). Where did you learn most of your values?

5. *Look for other [alternative] courses of action and their possible results [consequences].*
   Usually we are given at least two choices of action. Sometimes, we are given many more. In fact, sometimes there are so many choices it actually is confusing. Think about the choices AND results when studying about the problems of our environment. YOU may be the one to discover an important alternative to our present actions.

6. *Be willing to live with the consequences of one's decision.*

   As we learn more about nature's delicate balance, often described as "the web of life," we see that many of our past choices have resulted in dirtying (polluting) our surroundings (environment). If we decide NOT to live with this condition - that is fine. But what are our other choices? That is the reason for this unit on critical thinking and decision-making - to find other choices with which we will be more willing and able to live. In short, to have a quality life in a quality environment.

adapted from: Decision Making
Beacon Press
Boston, Mass.

DF/72

B. C.
by Johnny hart
I FEEL GUILTY, WE SHOULD BE DOING SOMETHING ABOUT THE ECOLOGY.
...HOW BAD IS IT ?
WELL, ACTUALLY, ... AT THE MOMENT ITS MINUSCULE!
...I ASSUME THAT MEANS WE CAN SCREW AROUND TILL ITS TOO LATE, ... THEN MAKE A BIG DEAL OUT OF IT.

By permission of Johnny Hart and Field Enterprises, Inc.

INSTRUCTIONS - Cartoons are also a form of communication. Read the above cartoon. What is the author trying to say? Is there more to the cartoon than just the characters and the words in the "balloons?" Does the cartoon say anything about the environment? Does it say anything about people and how they act? Write a comment or statement below which tells your feelings and thoughts about the problem. If more writing space is needed, use the other side of this page.

By permission of John Hart and Field Enterprises, Inc.

INSTRUCTIONS - Cartoons are also a form of communication. Read the above cartoon. What is the author trying to say? Is there more to the cartoon than just the characters and the words in the "balloons?" Does the cartoon say anything about the environment? Does it say anything about people and how they act? Write a comment or statement below which tells your feelings and thoughts about the problem. If more writing space is needed, use the other side of this page.

B. C.
by Johnny hart
WHAT ARE YOU DOING?
I'M GOING TO BURN THESE LEAVES.
...AND POLLUTE THE AIR?... YOU SHOULD BE ASHAMED OF YOURSELF!
BY GOLLY, THE RED ONES AREN'T HALF BAD!

By permission of John Hart and Field Enterprises, Inc.

INSTRUCTIONS - Cartoons are also a form of communication. Read the above cartoon. What is the author trying to say? Is there more to the cartoon than just the characters and the words in the "balloons?" Does the cartoon say anything about the environment? Does it say anything about people and how they act? Write a comment or statement below which tells your feelings and thoughts about the problem. If more writing space is needed, use the other side of this page.

DUNAGIN'S PEOPLE by Dunagin

"BE REASONABE. DO WE INVADE YOUR WATERS AND MESS UP YOUR....? DON'T ANSWER THAT."

By permission: Publishers Hall Syndicate, and the Columbus Dispatch.

INSTRUCTIONS

Write a comment about the "bad" side of progress. Is it really important to protect other life forms (like ducks), and other forms of society (even primitive ones)?

Write your comments below and explain the reason for your choice. Was your choice and commentary based on emotion, scientific knowledge, or because "it is the thing to do?" Is one of these the "best?" Explain.

DUNAGIN'S PEOPLE by Dunagin

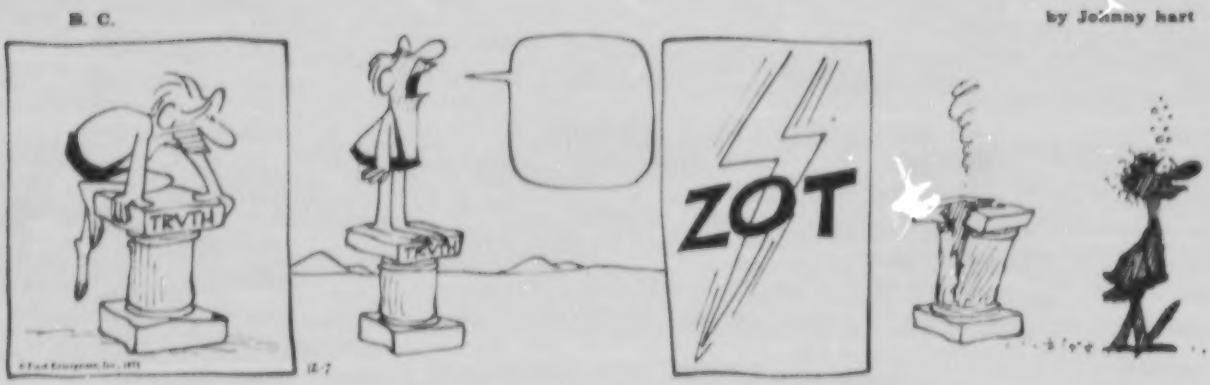
"WE'VE FOUND IT! A CIVILIZATION STILL IN THE STONE AGE! NO CONTACT WITH THE OUTSIDE WORLD FOR HUNDREDS OF YEARS..."

By permission: Publishers Hall Syndicate, and the Columbus Dispatch.

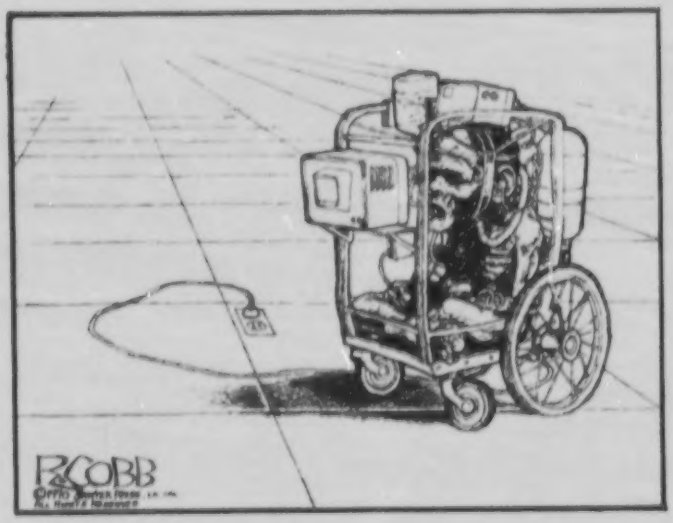
INSTRUCTIONS

Write a comment about the "bad" side of progress. Is it really important to protect other life forms (like ducks), and other forms of society (even primitive ones)?

Write your comments below and explain the reason for your choice. Was your choice and commentary based on emotion, scientific knowledge, or because "it is the thing to do?" Is one of these the "best?" Explain.



INSTRUCTIONS - 1. Write your own caption in the empty "balloon".
2. Your caption should say something about the environment that most people believe to be true, but which is actually false, and results in our being struck by an environmental bolt of lightning.
3. In the space provided below, explain your choice. (If more writing space is needed, use the other side of this page.)



MAN
VICTORIOUS OVER NATURE

INSTRUCTIONS: Carefully look at the cartoon and its title. Write a short article telling what you think and how you feel about it. (If you need more writing space use the other side.)

Conservation News, Nov. 15, 1970, p.16.

Advertisements are a form of communication. They are designed to sell a product or service. To do this, the people who create the "ad" must somehow get the consumer (buyer) to want to buy the product or service they are offering for sale. Whether the product or service is a real necessity, (we need it; we cannot do without it), or a convenience, (it would be nice to have, but we can do without it), the problem for the advertising people is to get the consumer to WANT it. The consumer must be convinced that he needs or wants this product or service more than any other item that he can afford to buy.

To buy, or not to buy, that is the question! Sometimes, the ad man uses "trick" phrases, difficult words, and even "half-truths," in his effort to convince us to spend our money on his clients product or service. If this happened all the time, we would know it and watch all "ads" very carefully. But it doesn't. And, believe it or not, this can make it more difficult to recognize the "trick" ad, because they are hidden among all of the "honest" ones. Could you recognize an ad that contained false ideas or information? Look at this ad and see if you can find any false ideas or information. List below anything that you suspect as being inaccurate or incorrect. Discuss them in class. Perhaps you could look in magazines and local newspapers for other examples.

Some people never see the forest for the trees.

They can't get close enough by car.

And so some of Nature's oldest and most beautiful creations remain unnoticed.

Which is a pity. And which is also unnecessary.

Because a Suzuki trail-cycle can get you deep into the heart of the forest. Close enough to count the rings in a stump, or pick a leaf.

Suzuki is built to take on the country.

You can maneuver one in and out of the trees as easily as leaning your body. Just like a slalom skier. You can take the roughest bumps, or go over knotty stumps because a Suzuki has a deep-cushioned suspension.

You can go up the steepest hills because a Suzuki two-stroke engine delivers power every stroke. And instant acceleration.

You can go for 12 months or 12,000 miles* and still be covered under the Suzuki warranty, that's how rugged we build them.

And you can ride your Suzuki into the forests and know the forest will be there when you get back. Because Suzuki builds a spark-arrester in the muffler.

After all, like Smokey says, if you're going to see the trees, help save the forests.

SUZUKI

*Covers all internal parts of cylinder head, block and transmission. Purchaser must comply with Owner's Manual instructions, mail registration to Suzuki within 48 hours, and receive service checks from a franchised Suzuki dealer at 750, 2,000 and every 2,000 miles thereafter during warranty period.

From: Life Magazine

Suzuki:
built to take on the country.

sound facts

Columbus Dispatch
December 19, 1971

Noise is defined by acousticians as "meaningless sound."

It has been estimated that since 1939, the sound intensity of "community noise" has increased a thousand-fold.

Eighteen million Americans suffer from some degree of hearing loss.

The Evinrude Co., in 1968, produced its first "quiet-model" outboard motor. Young people, however, wanted the noisy motor because it gave the illusion of speed and power.

Prolonged or sudden noise, for those that suffer from diseases such as heart trouble, asthma, ulcers and gastrointestinal spasms, can adversely affect them.

Even when sleeping, noise will not relax its grip on you.

The body shows no sign of an ability to become conditioned to noise, of any kind.

The worst characteristic of the sonic boom is its suddenness.

In the Ginza district of Tokyo, a large sign flashes the noise level of the immediate vicinity and then reminds the passerby that a 70-decibel intensity is the maximum safe level for a commercial area.

decision

INSTRUCTIONS: Briefly write your decision or point-of-view below after reading the two newspaper article re-prints and the information above.

Columbus Dispatch
March 3, 1971

INDUSTRY, WORKERS BACK SST

WASHINGTON (AP) - The aircraft industry and organized labor are launching a joint effort to enlist public support for the embattled supersonic transport (SST) plane.

Their campaign, flying the colors of American Industry and Labor for the SST, got a boost from a government advisory committee report saying the SST would be no nosier than present jumbo jets in the air or on the drawing board.

THE LABOR-INDUSTRY group, with a $350,000 budget, bought full-page ads in Washington's three daily newspapers to tell Congress why it should fully fund construction of two SST prototypes.

Similar ads in labor publications will urge rank-and-file members to write to their congressmen, said Floyd E. Smith, president of the AFL-CIO International Association of Machinists.

Smith and Donald J. Straight, a Fairchild Hiller Corp. vice-president, are co-chairmen of the lobbying effort which they said has broader motivation than simply the protection of millions of dollars in investments and more than 100,000 jobs riding on the SST program.

THE INDUSTRY-labor group said SST opponents have exaggerated claims of how the plane would foul the environment with noise and pollution.

A Transportation Department advisory committee told the government's SST development director, William M. Magruder, the 2,000-mile-per-hour plane would stay within the Federal Aviation Administration airport noise limit of 108 decibels.

Congress is scheduled to vote in March on continuing $1.3 billion in federal funds to get two SST prototypes into the air by 1973. The Senate voted 52 to 21 against the program last year but compromised with the House to continue government spending through March.

AN ASSOCIATED Press poll of House members last week showed building resistance, with 202 members against it, 188 for and 43 undecided or uncommitted.

Legislation is being considered in 14 states, including New York, Illinois and California, to impose aircraft noise limits which could ban SSTs.

J

Columbus Dispatch
March 11, 1971

GODFREY, OTHERS HIT SST PLAN

WASHINGTON (AP) - Supersonic jet liner opponents including radio and television personality Arthur Godfrey say federal funding of the SST is an obscenity and its promised jobs are "palpable nonsense."

"The world needs an SST now about as much as we need another load of moon rocks," Godfrey told the Senate Appropriations Committee.

"WHEN Americans want a plane like that," he said, "they'll finance it themselves."

Representing the Coalition against the SST, Godfrey said the planned $1.3 billion federal funding for two SST prototypes "is an obscenity" in view of other national needs.

Arthur Okun, chairman of former President Lyndon B. Johnson's Council of Economic Advisers, told the committee President Nixon's argument that the SST will mean 50,000 aerospace jobs is "nonsense and palpable nonsense."

OKUN SAID many federal programs create jobs and there is no evidence that the SST will create any more than other federally funded programs such as health, manpower or urban renewal.

He said taxpayers - many of whom do not fly - should not be forced to pay the bill for the plane's development.

"Why should they pay the bill?" Okun asked. "What criterion makes the SST different from color television or flip-top-cans?"

SEN. CHARLES H. Percy, R-Ill., said an unnamed executive of a major U.S. airline had told him Congress faces not a $1.3 billion decision but a $20 billion decision because the aviation industry will need federal aid to manufacture the SST as well as develop it.

Administration witnesses say SST manufacturing costs will be $3 billion to $5 billion, not $20 billion, and have stressed the federal government intends to spend no more than the $1.3 billion.

OBSERVATION SHEETS: TEACHER INSTRUCTIONS/ SUGGESTED QUESTIONS.

Below are the five major topics which appear on the student observation sheets. (The topic entitled "The Production Process" is not included because it is intended to be a direct-observation experience with follow-up discussion based on the direct-observation experience not on pre-conceived questions). Each topic has several sequential questions. They are suggested questions. You may want to delete some of them and add others of your own - please do so. (It would be very helpful if you would keep a copy of additional, or re-phrased questions, for consideration as the study progresses.)

I NATURAL RESOURCES

1. What is a natural resource?
2. Where is it located?
3. Do all things come from a natural resource? Name one that does not.
4. What is a renewable resource?
5. What is a non-renewable resource?
6. Is there any relationship between the location of the natural resource(s) and the location of the processing or production facility? Explain.
7. How is the natural resource taken from its surroundings?
8. How does it leave the environment or surroundings after it is removed?
9. Is anything being done to repair or re-claim the area from which the natural resource is taken?
10. How much does this cost (if it is being done at all)?
11. Who pays for it?

II PRODUCTION USE OF NATURAL RESOURCE(S)

1. How many natural resources are being used in this plant?
2. Why are they being used?
3. Does this plant provide jobs for people like your parents? Is that important? Why?
4. Does the plant, which is making or processing this natural resource, pollute the environment (surroundings) in any way?
5. Which is more important - the product, or a clean environment?
6. On what did you base your decision or answer?
7. If there is a pollution problem because of the production or processing going on at this plant, can it be prevented? How?
8. Who will pay the cost?

III THE PRODUCT

1. What is the product that is made or processed at this plant?
2. Why was it made in the first place?
3. Who buys it?
4. Why do they buy it? How do they use it?
5. Is it a "necessity" or a "convenience" item?
6. Are "necessities" and "conveniences" the same for all people?
7. Will using it add to our pollution problems?
8. If "yes" explain in what way(s) its use will add to the pollution problem?
9. In what way(s) can this additional pollution problem be eliminated entirely?
10. What is the "life-expectancy" of this product or thing that has been processed?
11. What will become of this item when it is no longer needed?
12. Will throwing it away add to the pollution problem? If "yes" explain how.
13. What does the word recycle mean?
14. Can this product or item be recycled? If "yes" make a list showing how.

IV BY-PRODUCT (ESPECIALLY WASTES)

1. What is a by-product?
2. If undesirable by-products are a problem, is there any way to overcome this problem? How?
3. Make a list of undesirable (to the environment) by-products for this particular plant.
4. Are these by-products just a nuisance or is it actually a danger to the environment (plants AND animals INCLUDING man)?
5. Who says that these by-products are dangerous?
6. How do they make their living?
7. Are there any people who say that they are not dangerous? Who are they?
8. How do they make their living?
9. How do you and I know who is "right?"
10. Is there anything at all that the average citizen can do about the pollution problem (if it really exists)?
11. Make a list of some things we can all do.

V CONSERVATION

1. What is conservation?
2. Do you think it is important? Why?
3. In what ways can this manufacturing or processing plant conserve our natural resources? Make a list of the ways this can be done.
4. What can you do as an individual? Make a list of the ways this can be done.
5. If we do not pay more attention to good conservation practices, what will happen?
6. Who will pay?
7. In what way will we pay?
8. Can/Should conservation take place during <u>all</u> of the above stages?

OBSERVATION SHEETS: (NAME OF FIELDTRIP)_____

INSTRUCTIONS: Carefully look over the observation sheets BEFORE you take your fieldtrip. Study and discuss the definitions given for each of the items below. Do you agree with the definitions? Can you think of corrections, additions, or even a better definition? If you can, write them down so you will remember them. Now, discuss with your teacher and the rest of the class, the questions that you will want to ask DURING the fieldtrip. (Please keep in mind the items listed below. Do the questions fit them?) Leave space for answers to your "classroom" questions. Also leave space for questions AND answers that might occur to you while you are on the fieldtrip.

I NATURAL RESOURCE(S): Any naturally occurring substance for which a use has been observed or discovered; may be categorized as, (A) non-renewable - (1) exhaustible - materials such as coal; (2) inexhaustible - materials such as the sun; and (B) renewable - materials such as plants, animals, and humans.

II PRODUCTION USE OF NATURAL RESOURCE(S) [PRODUCTION PROCESS]: The art of producing or making something; to manufacture [manufacture - make by hand or machine; make into something useful.]

DF/72

III THE PRODUCTION PROCESS

NAME OF: LOCATION, MACHINE, STAGE OF PRODUCTION OR PROCESSING.	PRODUCTION PROCESS (WHAT'S HAPPENING HERE?)

IV THE PRODUCT: That which is produced; result of work or growth.

V BY-PRODUCT(S): Something produced in making or doing something else; not the main product.

VI CONSERVATION: *The wise use of natural resources for the benefit of the greatest number of people, in the most economical manner, for the longest period of time.* Gifford Pinchot.

DF/72

GLOSSARY OF ENVIRONMENTAL TERMS

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economy	by-product	_____	_____
natural resources	decibel	_____	_____
renewable	recycle	_____	_____
non-renewable	pollution	_____	_____
effluent	pesticide	_____	_____
environment	herbicide	_____	_____
waste	ecology	_____	_____
consumer	reclamation	_____	_____
municipal	population	_____	_____

WORDS & DEFINITIONS

_____	_____
_____	_____
_____	_____
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_____	_____

This map shows some of the major streams of the Columbus metropolitan and central Ohio area. Also included are some of the major highways such as; State Route 23, Interstate 71, the innerbelt, and the outerbelt (Route 270).

Using this map, please complete the following exercises and questions:

1. Locate and name Worthington.
2. Locate and name the four major streams or rivers that flow into the Columbus area.
3. In which direction do the rivers and streams in our area flow?

   _____

4. What are their names?

   _____

   _____

   _____

   _____

5. Locate the reservoirs shown on this map.
6. What are their names?

   _____

   _____

   _____

   _____

7. Are all of them shown?
   Yes_____ No_____
8. If "No" explain why they are not.

   _____

   _____

   _____

   _____

   _____

   _____

9. What major river, which passes through the Columbus area, flows all the way to the Ohio River?

   _____

10. Locate and name; Delaware, Circleville, Chillicothe, and Portsmouth.
11. Using a triangle ▲ , locate Columbus' water treatment plants.
12. Using a square ■ , locate Columbus' sewage treatment plants.
13. Who owns and runs these plants?

    _____

    _____

14. Are there any other water treatment or sewage treatment plants in the area? If so, who owns and operates them?

15. On the section of map that you are given, are there any reservoirs shown in the area south of Columbus?
Yes _____ No _____

16. If "No," how do the people get their water?

17. Does Delaware have a water treatment plant?

18. Does Delaware have a sewage treatment plant?

19. Does Westerville have a water treatment plant?

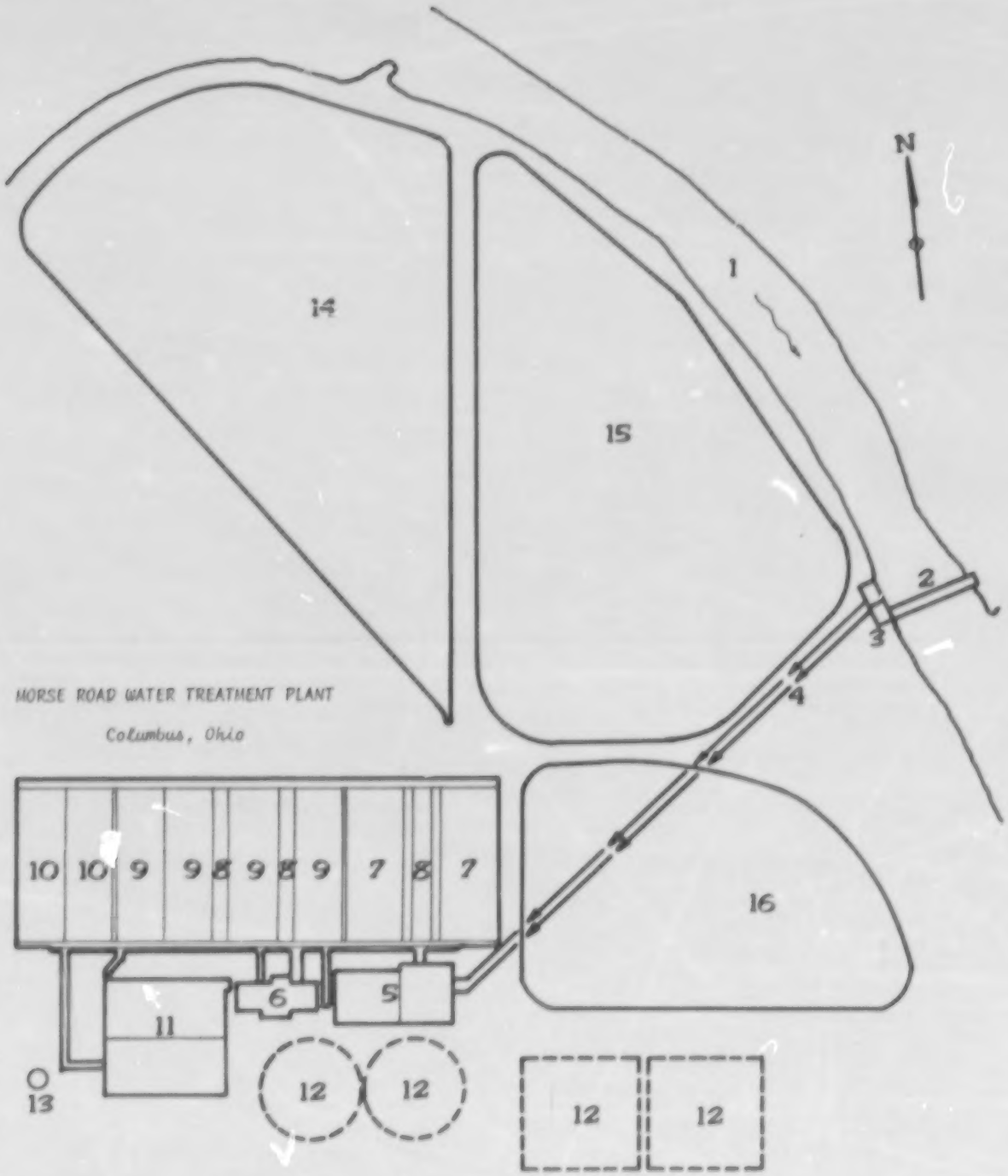
20. Does Westerville have a sewage treatment plant?

21. Where does the Columbus area (including Worthington) get the water it uses in its water treatment plant?

22. Can our "modern" sewage treatment plants treat 100% of the water, 100% of the time?

23. What does this mean?

summary:



1. Big Walnut Creek
2. Intake Dam
3. Intake Pool
4. Raw Water Conduits
5. Pump Building
6. Chemical Building
7. Clarification Tanks
8. Flocculating Tanks & Settl'ng Basins
9. Softening Basin
10. Recarbonation Reaction Basin
11. Filter Building
12. Clear Wells
13. Wash Water Tanks
14. Calcium Sludge Lagoon #1
15. Calcium Sludge Lagoon #2
16. Alum Sludge Lagoon #3

OBSERVATION SHEETS: (NAME OF FIELDTRIP)_____

_____

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_____

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_____

_____

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DF/72

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NAME OF: LOCATION, MACHINE, STAGE OF PRODUCTION OR PROCESSING.	PRODUCTION PROCESS (WHAT'S HAPPENING HERE?)

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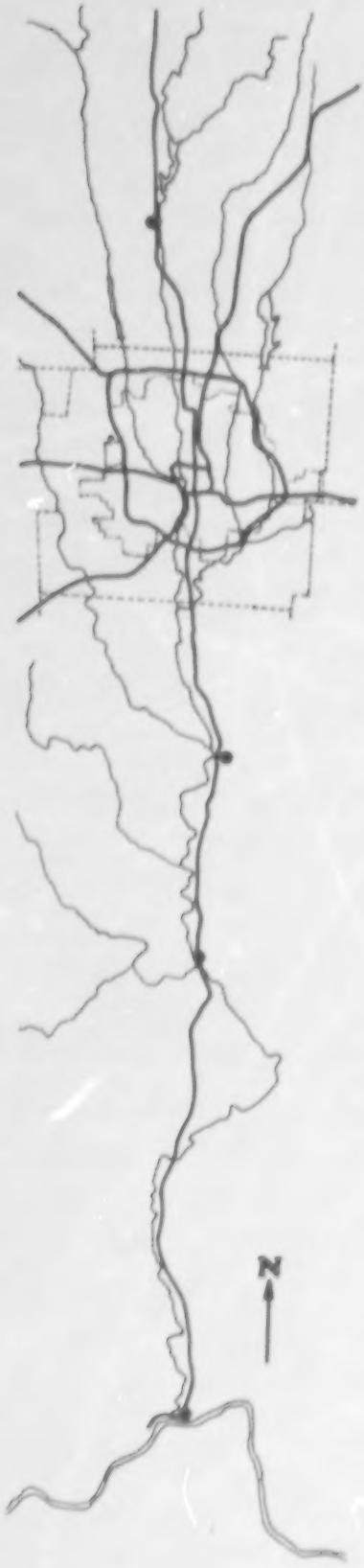

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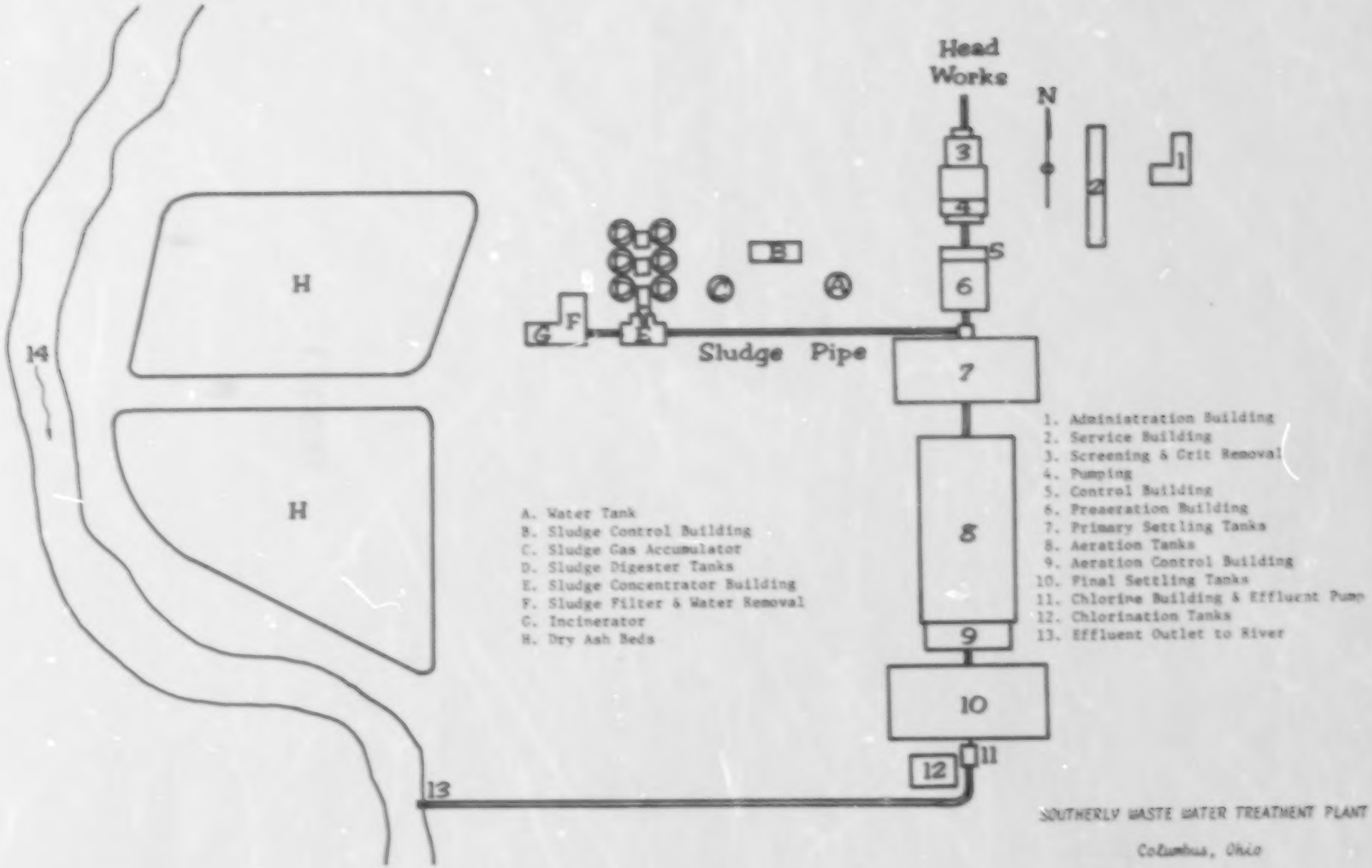

A. Water Tank
B. Sludge Control Building
C. Sludge Gas Accumulator
D. Sludge Digester Tanks
E. Sludge Concentrator Building
F. Sludge Filter & Water Removal
G. Incinerator
H. Dry Ash Beds

1. Administration Building
2. Service Building
3. Screening & Grit Removal
4. Pumping
5. Control Building
6. Preaeration Building
7. Primary Settling Tanks
8. Aeration Tanks
9. Aeration Control Building
10. Final Settling Tanks
11. Chlorine Building & Effluent Pump
12. Chlorination Tanks
13. Effluent Outlet to River

SOUTHERLY WASTE WATER TREATMENT PLANT

Columbus, Ohio

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DF/72

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_____	_____
_____	_____
_____	_____
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_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

the major POLLUTERS' inventory checklist

1. ESTIMATE (do not count) the number of electrically (A.C.) powered appliances in your home.

   Write your estimate here: _____

2. LIST all electrically powered appliances in your home. Include those which you own but do not use. DO NOT include your telephone(s). Put an asterisk (*) beside each item that is a convenience but which you could do without. USE THE FOLLOWING PAGE FOR YOUR LIST.

LIVING ROOM

UTILITY ROOM

FAMILY ROOM

GARAGE

KITCHEN

BASEMENT

DINING ROOM

ATTIC

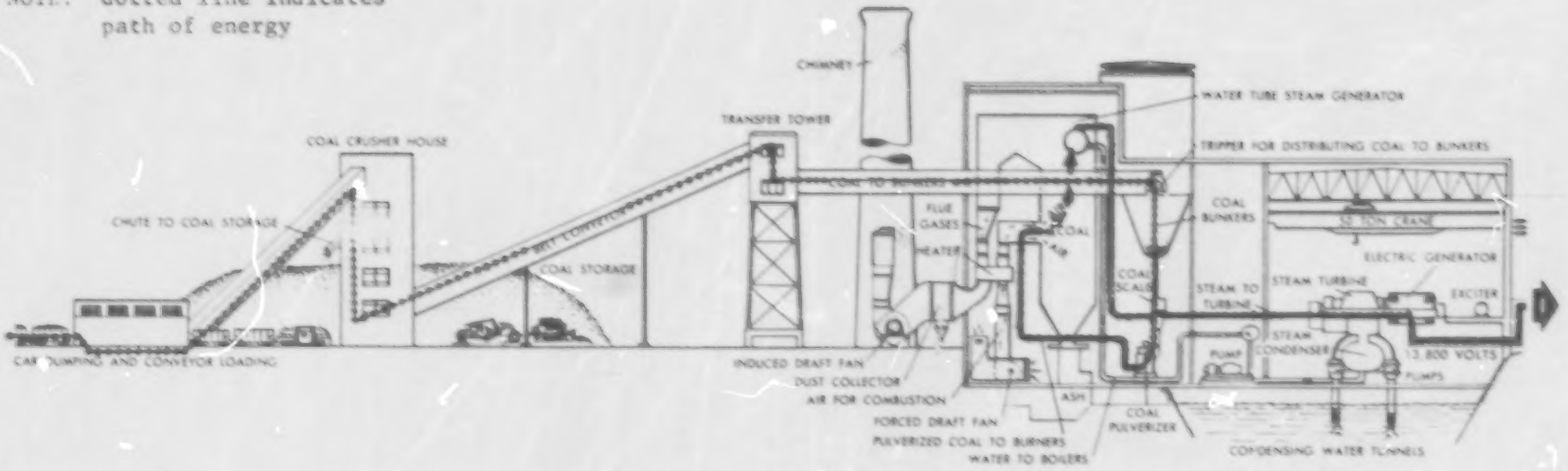
BEDROOM(S)

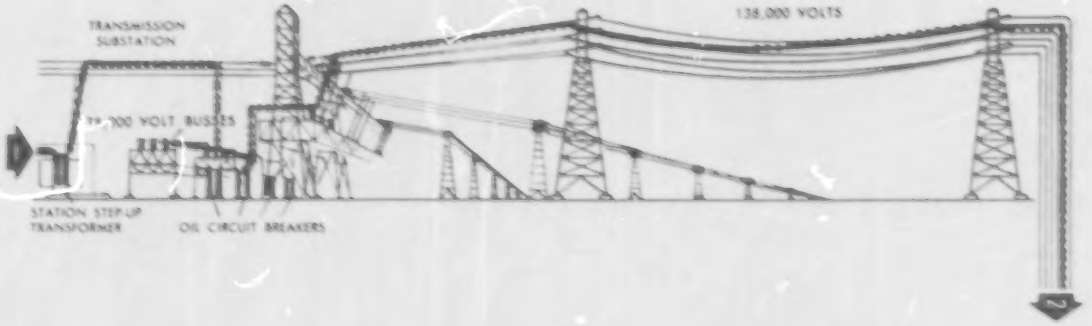
OTHER

BATH

3. When you have completed your list - TAKE IT HOME AND ADD ANY ELECTRICALLY OPERATED APPLIANCES THAT YOU MAY HAVE OVERLOOKED. How many did you leave out of your first list?_____

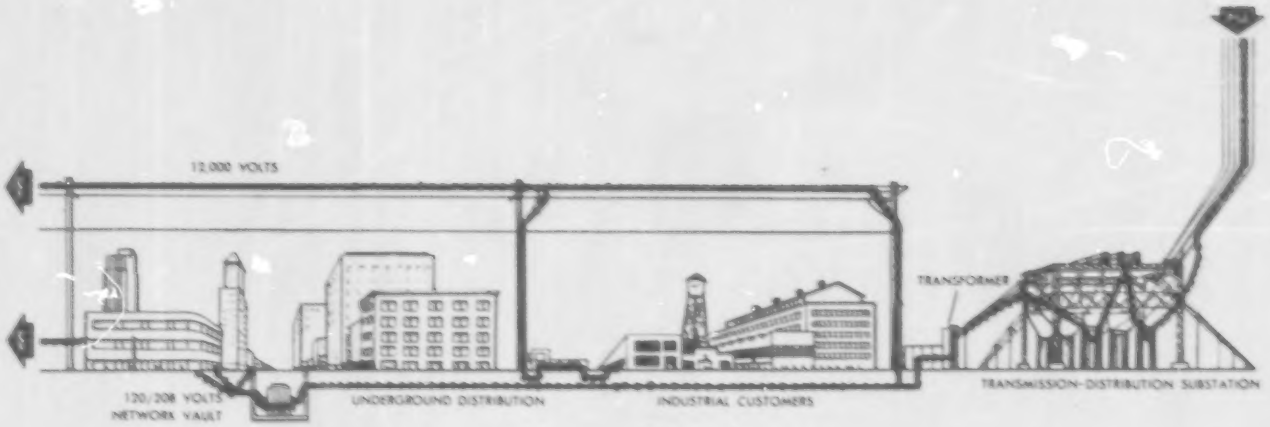
NOTE: dotted line indicates
path of energy

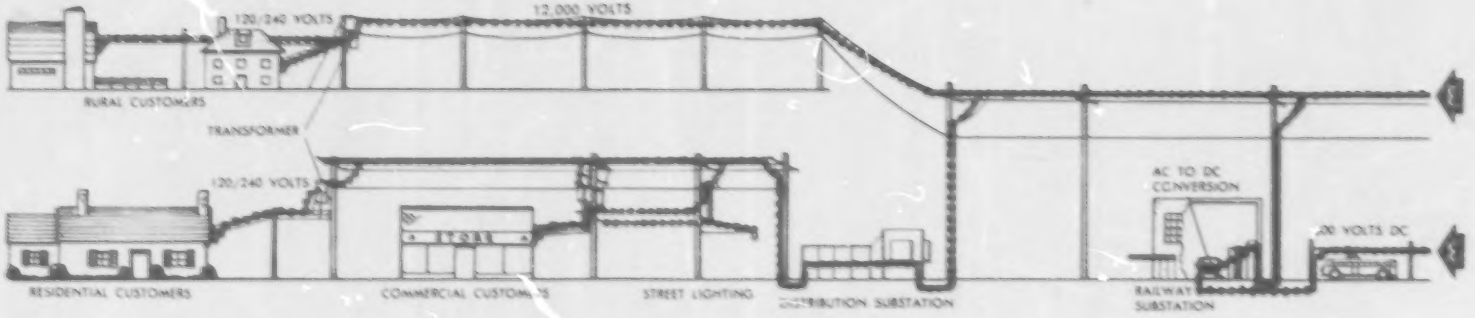




ELECTRIC GENERATING & TRANSMITTING

from: Living With Electricity





ELECTRIC CONSUMERS (USERS)

OBSERVATION SHEETS: (NAME OF FIELDTRIP)_____

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DF/72

GLOSSARY OF ENVIRONMENTAL TERMS

INSTRUCTIONS: The list of words below is in no way complete. It is not intended to be. First, find definitions for the words below. Then, as you proceed with your study of the environment and its problems, add new words and definitions as it becomes necessary. The blanks under the title "WORD LIST" are for your use when adding words. The two columns below (and on the back of this page) are for your use when defining words. Write both the word and its definition.

WORD LIST

conservation	product	_____	_____
economy	by-product	_____	_____
natural resources	decibel	_____	_____
renewable	recycle	_____	_____
non-renewable	pollution	_____	_____
effluent	pesticide	_____	_____
environment	herbicide	_____	_____
waste	ecology	_____	_____
consumer	reclamation	_____	_____
municipal	population	_____	_____

WORDS & DEFINITIONS

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SCHOOLS AND THE ENVIRONMENT

"The key to preserving the human environment is the collective behavior of individual citizens."

Edward A. Ames
Program officer in the Office of Resources and Environment of the Ford Foundation. This paper was prepared for the American Nature Study Society, 27 December, 1969.

THERE IS a characteristic impulse in our society to turn to education to solve complex social problems. This impulse was exemplified by the flood of attempts at curriculum reform in science and math that followed the launching of Sputnik in 1957. The emergence of Russia's scientific eminence was seen as a threat to national security and the scramble was on. So it is that Congress, reflecting the public's concern over the deterioration of the physical environment, is now considering two bills which would support educational programs designed to protect the quality of the nation's environment. This congressional effort may well reinforce the efforts of those educators and laymen who have worked to develop programs in conservation, outdoor education, and the natural science for our schools during the last few years. While this source of potential support can only be welcomed, some hard questions should be raised by the expectation that our schools can achieve the social goals which are implicit in this challenge.

Senator Gaylord Nelson, in introducing the Environmental Quality Act in Congress, recognized that the problem of checking environmental deterioration is largely a behavioral one. He then made the following statement:

> Education, I believe, is the only proper way to influence values, attitudes, and basic assumptions in a democratic society. Behavior, in the long run, can best be changed through the process of education.

A number of questions ought to be asked about this statement. For instance, what kinds of behavioral changes are needed to halt environmental deterioration? Who is to prescribe them? How are they to be achieved through education? How are behavior and social values affected by our school systems? I suggest, that if we really examined these questions we would get some unexpected answers, that the assumptions on which much of our current environmental education are based are questionable utility, and that we have not yet come to grips with the underlying basis of the environmental problems which face us.

The values which affect society's behavior toward the environment are fundamental, widely held, and deeply involved with our perceptions of the world around us. For instance, as a society we attach an almost mystical importance to the inevitability of progress and to the value of economic growth. So much so that we seldom examine these ideas, even though they are by no means shared by other people around the world or even by all segments of our own society. Progress, of course, is not inevitable, and growth, whether in human population or in gross national product, has finite limits. The fact that we

continue to behave as though this were an infinite world even though we clearly know better, leads us to some pretty grim conclusions about the future of our society. While one may disagree with the doomsday prophets predicting ecological disaster in this century, the trend is clear enough. 1

SCHOOLS AND VALUES

If our behavior toward the environment is indeed based on unexamined values and faulty assumptions, then it should be the business of education to examine these values and challenge the assumptions. While this idea sounds revolutionary, nothing less direct will stand a chance of being effective in changing social behavior. After all, our assumptions about the nature of the world and our role in it are widely held in society because they are constantly reinforced. The communications media, the behavior of our peers, and even our folk culture confirm our perceptions of the world. Examination of these perceptions must start with our schools since they also tend to reinforce whatever values are widely held by society at any given time. Indeed, they are one of the means by which we institutionalize our beliefs and transmit them to succeeding generations.

Much of this communication is done through implicit messages which are a part of the school environment and may or may not be contained in textbooks or other teaching materials. For instance, one of the most important messages from the point of view of environmental significance has to do with the child's perception of his role in society and of his ability to affect his environment, either for better or for worse. This is a particularly critical question in urban poverty areas where the effectiveness of the individual is so much in question. We can assume that a teacher who comes from a different cultural background and lives in a different neighborhood will not share the same environmental perceptions and concerns as his children. If, at the same time, that teacher has a low estimation of the ability of his children to relate to the broader social community in coping with their problems, a message of futility and isolation comes through to those children all too clearly. *Students in more privileged suburban schools may receive different messages but ones which also have unfavorable implications for their values and behavior in relation to their environment. I would guess that it is an unusual classroom in which students are encouraged by either practice or example to examine critically that which is bad in their environment or to question at all the assumptions and values which underlie environmental deterioration. In general, we do not seem to give children a very high estimation of their ability to effect change or even to do more than passively cope with the environmental insults which our society has prepared for them.*

David Hawkins, an educator at the University of Colorado, often performs the simple test of examining bulletin boards and physical materials being used by pupils to determine what is happening in the classroom with regard to environmental education. It is rare that he finds any significant clues as to the nature of that specific physical and social environmental surrounding a school. While there may be a map or two, most of the material is generalized and representative of any area of the country. Usually such physical evidence is a good indicator of the teacher's approach, of the children's activities, and hence of the kinds of learning experiences that take place in that classroom. A self-contained classroom isolated from the surrounding community

provides a sterile atmosphere for learning about environmental problems, whether one approaches them from the point of view of their social or physical basis. But perhaps more importantly, this kind of classroom environment may impart implicit messages about the relevance of environmental concerns, messages with obviously negative implications for the way in which those children will perceive their role in effecting environmental change.

If we are to change the behavior of children through formal education, which is precisely the challenge before us, we obviously must understand and change some rather basic aspects of the school environment. Furthermore, education will have to be organized around the goal of teaching children how to be effective agents for change so that they in turn may participate in the social processes which shape their communities and their lives. Environmental education, when viewed in these terms, becomes a fundamental part of the school experience.

Much of the quite extensive effort at environmental education which has been mounted in recent years has been at quite a different level. The main thrust has been to teach children about the natural environment through interpretation of the landscape and the processes which change it. But this ecological emphasis, important though it may be in its own right, has been mounted from outside the school system and has seldom come to grips with the broader social issues which now concern us. Ecology as curriculum content is primarily useful in that it relates a great deal of diverse information about the environment and its processes. I do not question for a minute the importance of environmental learning in this sense, but in competition with other subjects it must remain a relatively distinct part of the curriculum and as such represents only a limited gain.

What is needed is a far more eclectic approach to education, an approach which would embrace many new kinds of learning experiences. These new experiences would be selected to involve students in the critical analysis of, among other things, the social values and interactions that underlie environmental degradation. A high priority would be placed on the processes of inquiry and problem solving but the focus would be outward into the community and on actual problems affecting the lives of the students.

RESEARCH BY STUDENTS

A good example of this kind of environmental education is the water pollution research problem at the Tilton School in New Hampshire. The students learn about the science and technology of pollution by doing research on the water quality in local streams and lakes. In addition to learning a good deal of basic science they also produce data that are useful to the Federal Water Pollution Control Administration. But, rather than stopping at the academic boundary of their subject, the students then investigate relevant legislation on water quality, and finally pursue the economic and political consequences of the enforcement of that legislation. All of this is done using actual local problems as a case study. The behavioral objectives of the Tilton work have to do with the ability of the students to carry out a research program, produce acceptable data, and analyze actual environmental problems. I can only surmise that the implicit messages that are communicated to the students doing such work will have an important influence on their roles as individuals in society and with their

responsibilities in relationship to their environment.

There are, of course, all sorts of barriers to initiating such open-ended work in the schools. The basic structure and organization of the classroom are often inimical to environmental education and teachers lack the training and experience to organize such programs. It is far easier to teach about the environment as a generalized subject with the support of textbooks and films than it is to conduct an open-ended inquiry into the specific problems of an actual community. It is also easier to relegate the entire responsibility for environmental education to specialists from outside the school system, perhaps at the end of a busride at a local nature center, than it is to embrace environmental education as a fundamental aspect of the overall curriculum.

COMMUNITY INVOLVEMENT

Changes in education are taking place, however, and there are trends developing which should make it easier to pursue environmental education in the classroom. For instance, in many urban areas there is a drive toward greater community involvement in the schools. This is more than a matter of control over the administration of the school, although that may be the prime motivation behind the movement. In fact, community education makes it possible to draw upon many kinds of community resources, both human and institutional, to support the educational program at the school. In Philadelphia at the Parkway School, and in Baltimore's Dunbar High School, programs are either being developed or are underway in which entire segments of the curriculum are conducted in agencies of the municipal government, in businesses, and in local cultural institutions such as zoos and museums. Efforts are being made to involve representatives from the community and from local colleges in classes taking place within the school itself. The potential for environmental education is obviously far greater under these conditions than it has been in the traditionally more restrictive school. But this potential remains to be fulfilled and the opportunities for environmental education may not be recognized as such even in the schools themselves.

While the examples I have cited above happen to be high schools, there are similar trends developing in elementary schools. Here the line of attack is to break down the traditional concept of the self-contained classroom which has always limited the kinds of learning experiences provided by the school. Team teaching, to the extent that it involves teachers with a variety of backgrounds working in close cooperation with each other, has cracked the classroom wall. Further inroads are being made by schools experimenting with open-structure or with the integrated day[2], an approach to education based on the works of John Dewey and Jean Piaget, but developed most fully in British primary schools. Here as in the high schools, we are dealing with a potential for imaginative programming which has not been widely recognized, particularly on this side of the Atlantic.

The significance of the integrated day for environmental education is profound indeed. It places an emphasis on an eclectic environmentalism based on the heavy use of materials found in the local environment ranging from building rubble to living plants and animals. It combines classrooms, breaking down the walls so that children can work together in teams on problems which interest them and at the same time provide valuable learning experiences. It disregards the traditional subject area boundaries and follows a unified approach to learning which much more closely approximates the child's actual

perception of his environment. It drops the rigid schedule enforced by periodic bells and allows the use of blocks of time to pursue problems which could not even be tackled in a more traditional classroom. In fact, after seeing an integrated day in process, it is hard to imagine how effective environmental education could be pursued in the elementary school under any less open-structured conditions.

An integrated day affords an opportunity to achieve certain behavioral objectives through the kinds of learning experiences that it provides for children. Thus the excavation of a pile of building rubble treated as a neighborhood archaeological site might be used to teach a good deal about exploratory techniques and problems solving as well as about the history, climate, demography, and so forth, of their community. But, in addition, the fact that the teaching deals with the immediate environment and involves children in an open-ended exploration of those surroundings carries an implication for the children that their own environment and their individual perceptions of it really count. This kind of individualized, child-centered learning which deals with the immediate physical surroundings certainly develops different and presumably more positive attitudes, values, and behavior toward the environment than the traditional, more structured approaches. Furthermore, we can make the assumption that programs which involve students in attempts to solve actual environmental problems can engender a social commitment that may have a lasting effect on their behavior.

The more successful environmental programs have undoubtedly contributed to the willingness of the schools to open the classroom doors to new experiences. The great public concern over environmental degradation is now reinforcing that movement and the result may be the best chance yet for introducing behaviorally effective educational programs. To realize this opportunity, schools must make use of that particular environment perceived by their students. In effect they must teach <u>through</u> the environment using the community as a source of learning experiences rather than <u>about</u> the environment as a generalized object of study. Furthermore, if schools are to affect the behavior of children in order to moderate society's impact on the environment they must lead students to explore the social interactions and the whole system of human values, concerns, and assumptions which underlie our behavior. After all, the physical limitations of natural systems are constant, and technology is only effective in alleviating the pressures we place on our environment when we use it to that purpose. The key to preserving the human environment is inexcapably the collective behavior of individual citizens. In the final analysis, the success of environmental education will be measured in terms of its ability to change the behavior of society.

FOOTNOTES

1. For a particularly enlightening treatise on this subject see Garret Hardin's article, "The Tragedy of the Commons," in <u>Science</u>, Volume 162, December 13, 1968.

2. The term "integrated day" refers to a way of organizing the classroom without the formal constraints imposed by fixed-length classes dealing with specialized, academic disciplines. It also implies an inductive, individualized approach to learning.

ENVIRONMENTAL SENSITIVITY AND THE MASS MEDIA:

Using inconsistences in press, radio, and TV coverage to inculcate an ecological conscience

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Teachers have long utilized the mass media as a vehicle of instruction. English teachers assign their students to watch a play on TV, science classes view television commercials for pseudo-experimental tests against Brand X, and social science students watch the newspapers for comment on specific current events.

In a similar manner, teachers can utilize the mass media to sensitize their students to environmental anomalies, ironies, and non sequiturs which are implicit therein. Examples, appropriate to such "sensitivity training," follow.

Television commercials commonly include cinematic or cartoon depictions of animals whose status, if not precarious now, will be if man's present relationship with them continues. These ads bear the implicit assumption of the creature as an extant species, as a stable part of our culture, when in fact it may not be so for long. The properly sensitized learner should feel a degree of pain each time he views such a commercial. When directed to put a tiger in his tank, he will think: And where will I get it, when the tiger and its habitat are gone? When he is shown the puma atop an auto dealer's sign, he will ruefully imagine a pack of baying hounds below, and wonder when we will give adequate protection to the remaining 10,000 or so pumas. When he sees eagles hawking savings bonds he will think of thin egg shells. When rhinos charge across the savannah on behalf of a sport coupe, a menthol cigarette, a hair spray, or whatever, our learner should think of the hundreds slaughtered in recent years to satisfy a superstitious belief.

Magazine advertisements are a rich source of environmental ironies which students can ferret out. Before me as I write is a pile of ads collected over the past several years, and ranging from good to bad on a continuum of environmental awareness as displayed by the advertiser. Here are some very good ads from large oil and timber companies, with beautiful illustrations and appealing messages about the sound conservation practices of the companies. (Alert students will probably note, of course, that not all policies of these companies are as commendable as their advertisements.)

Reflecting a lower level of environmental sensitivity, here is a photo of a pristine California woodland, with words boasting that "not much has happened" to the area for a century, but "now watch the excitement begin" as it is developed into a community for 400,000 new Californians.

Worse, however, is an $800 tiger skin rug, with an eye-catching phrase in huge type: FOR THE DOG. A San Francisco import house offers this one. And here is Felix, in before and after photos. He was "chicken" before purchasing his new sports car. Later, adorned in safari outfit, he holds a lion head (dead) by the mane in one chubby hand and a rifle in the other. "Now they call him

Felix the Lionhearted," as testimony to his new-found virility.

As epitomes of crassness, however, I offer the following pair.

(1) A full-page color photo of an alligator and a pair of alligator shoes, with the message, "Don't you agree that these skins are far more attractive as (brand name) shoes than they were as alligators? $135 the pair." (Elsewhere in my pile of clippings is an account of the frenzied slaughter of alligators, as hunters try for all the skins they can obtain before the enactment of laws to protect the 'gators.)

(2) "Can you imagine what we're going to do with this" (photo of a woodland-farmland area) . . . "after we outgrow this?" (photo of sprawling parking lots and drab buildings). In this case a large and well-known corporation, proud of growing even larger, was so oblivious to the havoc it was about to wreak in its expansion program that it saw fit to boast about it.

Although the point has perhaps been made, the remaining examples are so choice that the writer cannot resist sharing them. Before continuing, however, we might take note of an observation by Matthew Brennan. A good environmental education is not all sweetness and light - it is necessarily a painful experience, at least until such time as we have more reason to be satisfied with trends than we do at present. The examples preceding and following certainly illustrate this idea.

A recent issue of a popular magazine displays an appalling paradox which some of our sensitized students would catch even though the persons laying out the magazine format may not have. Here, on the right-hand page, is a gorgeous glacial valley, with a single auto-less road and a few cottages. It is an ad for some attractive children's books, with the heading, "Is your child missing out on meadows?" Peace, quiet, serenity - that is, until the three young fellows on the opposite page arrive. They are unloading their trail bikes (which are the subject of this advertisement) from the trunk of their sport coupe (I don't know how they got them in there), adjusting crash helmets, and aiming their machines, albeit inadvertently, at the verdant valley just a few inches away. So much for the serene scene!

And here before me is a series of washing machine advertisements, with photos of assorted huge families of up to sixteen children, shown in nothing but a positive light.

Advertisements are certainly not the only source of such finds. Teachers can direct their female students to articles in the fashion pages of metropolitan newspapers for some real shockers. Try this one, from San Francisco. A $250 lynx parka with a removable hem of lynx tails "for those occasional days you just can't bear the idea of a lynx fringe." The purchaser will also receive a bonus bag of "100 fluffy lynx tails, to do with whatever your heart desires."

"Will it jump here?" So reads the witticism beside the picture of a kangaroo jacket and skirt. (Vague memories of a newspaper account of the decimation of this species flash before my mind's eye.)

Returning to the medium of television, we may hope that as the students' sophistication in TV-watching grows under our guidance, they will come to note such irrationalities as the following.

In audience participation shows, the inevitable mewing and applause which attends the announcement that the slatternly contestant is a mother of twelve.

Hunting programs which: (a) portray the quarry as "savage and fierce," while failing to note that these qualities are displayed to humans in defense, not offense; (b) portray them as "dangerous," while failing to note that they are not really very dangerous when viewed through gunsights; (c) brand them as "wanton killers," despite the obvious fact that it is the hunter who poses with his boot planted atop their carcasses, not vice versa. (Note: the reader should not infer that I am opposed to hunting - I am opposed only to that hunting which reflects a lack of intelligence, sensitivity, and concern for species preservation.)

A recent wildlife program which describes the capture of a jaguar, with no hint as to why it was captured. This omission implies that it is permissable to manipulate members of other species at our whim, without good cause.

And why, some perspicacious students may come to ask, is there no television campaign on any environmental issue that is nearly so intensive as that against cigarette smoking? Compared, say, to overreproduction, smoking is really a relatively minor vice: for the most part it endangers only the voluntary individual user rather than involuntary and innocent others, and it does not loom as a major threat to the biosphere and human survival. Would not a more closely examined set of societal priorities result in the replacement of the anti-smoking campaign with one directed against the population bomb? I find, subsequent to final typing of this article, that the same idea has recently been proposed in a pithy paper by - of all people - an environmentally concerned advertising man (2).

A rich resource for student inquiry is found in travel magazines, travelogues, and TV travel shows, since there is an interesting form of doublethink peculiar to these productions. It is closely akin to the fallacy pointed up by John Wilkinson in his essay, "The Quantitative Society":

> Americans have carried out more studies of an empirical nature than any other people in history on the effects on human beings of the mass society, the technological society, and the rest. The trouble with most American discussions is that they end on an unaccountable note of optimism. The last chapter: What is to be done? almost always pronounces a happy ending, in apparent discontinuity with everything that went ahead (5:68).

The similar fallacy expressed in travelogues takes the following form. The narrator first revels in the beauties of an area which retains a natural, pastoral, or agricultural temper. He then praises the urban-technological intrusions which are inevitably changing the character of the vicinity. Nowhere does he mention the mutual exclusiveness of the two general sets of phenomena which he lauds. His failure to take sides, or rather his implicit taking of both sides, is an irrational position.

A recent example was an hour-long television show which took the viewer down a wild river in a remote section of Mexico. The cameraman-narrator praised the magnificent scenery, the lush vegetation, the thrill of running rapids in rubber boats; especially did he laud the friendly people of the Indian villages scattered along the river. Their contacts with outsiders had been few if any; their

architecture and pottery lingered on from the days of Aztec civilization. Their cheerfulness was infectious.

Then, toward the end of the journey, the expedition was greeted by several persons in a motor launch! These, it turned out, were Mexican engineers surveying a projected damsite. They were camped in a dramatic narrows, with steep canyon walls reaching high above, a perfect damsite!

Here entered the doublethink, as it inevitably seems to do in these shows. Our narrator now praised these "well educated, fine men." He gloried in the jobs that would be brought to the people upstream! In short, he denied all that he had been saying for the first 50 minutes of the show. Not one word about the pending destruction of all that had given him so much pleasure, nor about the drowning of the rain forest, or the conversion of his wild rapids into a drab lake. Not one acknowledgement that the magnificent landscape, sculptured now in exaggerated vertical scale, would be smoothed to low relief as if one had used a sandblaster to reduce a Michaelangelo to a Henry Moore. Not one hint that the "jobs" for the people upstream would more likely take the form of chronic unemployment and third-class citizenship in a technological world, accompanied by the drowning of their ancient villages and alienation from what had been a stable and venerable culture. No mention that the associated blessing of modern medicine would bring over-population to the area, with the eventual impoverishment of both the people and the soil that once supported them.

Now, I would not require of such productions the narrator side with nature and Ned Ludd, as I obviously do. But until he takes one side or the other, he serves his viewers as a model of unexamined illogic. In the meantime, he can provide classes with an opportunity to discover and discuss the irrationality of his position, and to take sides themselves.

THE REPORTING OF NEWS

In this discussion of mass media, the reporting of news is due at least brief comment. It is obvious that among the adjectives currently applicable to this aspect of our culture are: episodic, incomplete, sensational, trivial. The new 60-minute weekly news shows seem to be a step toward something better, to the extent that they deal with the trend rather than with the improbable event, with the essential as opposed to the immediate. Also, environmental issues are suddenly receiving some of the attention they deserve in the news. Nevertheless, it seems clear that current news reporting is not entirely conducive to the formation of a highly discriminating and informed public. Here we have a vicious cycle, for with mass communications the nature of the market determines the quality of the product and vice versa. But as teachers and students examine the mass media for the kinds of inconsistencies that have been discussed here, perhaps they will contribute to an increasingly sophisticated public which better understands the great relevance of environmental-ecological news.

One desirable result of such growth would be increased attention by newscasters to the environmental business put before legislative bodies. The current deficiency in this regard is illustrated by a recent letter to the editor of Africana magazine. It concerned the Dingell Bill, aimed at preventing the importation of skins of endangered animals. An excerpt follows:

> The majority of Americans, including myself and many other interested persons, were completely unaware of this bill's existence.

Had I known of this earlier, perhaps my letter and the letters of many other American members and their friends would have turned the tide in favor of this bill's passage (1). Note: the bill (modified?) has subsequently passed the Senate and been signed by the President.

A second desirable result of improved public awareness would be state and regional news programming which includes summaries of the voting records, on environmental issues, of the legislators serving that area. As things stand now, I think I know who some of the Congressional "good guys" and "bad guys" are in matters pertaining to the environment, but one simply does not have time to follow the Congressional Record faithfully.

A third result would be political speeches dealing with issues rather than shibboleths, and political campaigns placing much less emphasis upon personalities, party politics, and clever ad men.

Fourthly, issues placed directly before the people might receive improved news coverage, while misleading information is concomitantly curtailed or exposed for what it is. In 1968, for instance, the voters of one coastal state narrowly defeated a beach acquisition plan which now appears to have been in the public interest. The voting result was almost certainly attributable to catchy TV commercials sponsored surreptitiously by huge out-of-state interests.

CLOSING COMMENTS AND QUALIFICATIONS

As noted earlier, the examples used herein have been collected over several years. The sudden and recent popular interest in environmental issues may already be obsoleting these examples. Offhand, I do not recall seeing large families lionized in the most recent washing machine advertisements, and I should be surprised if the applause for mothers of twelve is as loud in a few years as it has been in the past. In fact, it will be very interesting to reexamine the mass media a decade hence to see what changes in environmental sensitivity will be reflected.

Also, it should be noted on behalf of the media that the recent popular concern for the environment must have been positively and significantly influenced by mass communications, such as television documentaries on vanishing species, newspaper coverage of environmental conferences, and so forth.

Most of the examples herein have to do with specific vanishing species, dams, and other symptoms of the current ecological syndrome. Lest the writer be accused of sin by omission, he acknowledges that the core problem is population growth in combination with economic growth, along with the persistence of value systems which actively promote or passively condone these social and economic phenomena. I have given some further consideration to these issues elsewhere (3, 4).

This writer has not encountered a previous exposition of the thesis advanced here; apologies are offered if such a statement has been overlooked.

A very few words regarding pedagogy. After discussing a few examples of implicit ironies and inconsistencies, the teacher can have the students watch for examples of their own outside of class time. Teachers interested in behavioral objectives might use the following: "The student can select an environmental incongruity implicit in mass communications, and can describe the nature

of the inconsistency or irony which marks it." A student will have met the objective if, for instance, he can volunteer, "How about that koala bear who hates the airline for bringing so many people to his habitat? Maybe he should."

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test instrument

PREPARING THE TEST INSTRUMENT

One of the major aspects of the Metropolitan Environmental Education Resources Study was the use of statistical methods to determine the validity of the study thesis. That thesis is - "that fieldtrips are an aid to the students' educational growth." Stated another way, the study seeks to determine whether significant change occurs as a result of a specific fieldtrip activity (the treatment). It was necessary to find someone to assist in the construction and evaluation of the test instrument and the resultant statistical analysis. It was highly desireable that he or she should have had some experience in the field of environmental education. Mr. Walter B. (Ben) Bohl had both of the above qualifications. He had had several courses in statistics. Bohl also taught in the classroom and as a resource teacher on numerous fieldtrips. In fact, one of Bohl's special interests has been to measure the effects of fieldtrips. Consequently he has constructed, administered, and evaluated several test instruments.

TEACHER QUESTIONS - THE INVITATION & RESULTS

After the initial meeting with Bohl, contact was made with all of the fifth grade teaching teams in the Worthington City School system. The teaching teams agreed to administer the pre-test and post-test instruments. They were given the option to choose none of the fieldtrips, all of the fieldtrips, or any number between. Selected teachers from all of the teaching teams were invited to an introductory meeting. The purpose of the meeting was to encourage the classroom teachers to construct questions for the test instrument. This was an attempt to secure an input by the classroom teachers, and at the same time to accumulate a set of questions prepared at the proper level. This attempt failed! One of the stated reasons for this failure was that the teachers were intensively involved in the usual meetings that are so

characteristic of the early part of any new school year.

PREPARING OUR OWN

Since poor timing caused the untimely demise of an otherwise sound approach, Bohl and the author proceeded to independently prepare two sets of test questions. A first draft of the test instrument was then synthesized from the two independent sets of test questions.

EVALUATION OF THE INITIAL INSTRUMENT: OR 70 ITEMS ARE TOO LONG.

This first draft of the test instrument was sent out to all of the fifth grade teaching teams. They were asked to critique it in terms of phrasing, and ease of understanding. At this point one of the teaching teams said it was no longer interested in participating in the study. When those teachers were asked why they were no longer interested, they stated that the test was much too long to be given to fifth graders in one sitting. When it was suggested that the test be prepared in two parts, they said they would reconsider being a part of the study.

THE TEST: PART I & PART II

In its final form the test was prepared in two parts and all of the fifth grade teams participated in the administration of the pre-test and post-test instruments as they had originally agreed. Part I consisted of thirty (30) questions relating student attitude to current environmental problems and concerns. It was comprised of both attitudinal and factual questions. Part II consisted of forty (40) factual questions. These questions were arranged in four sets of ten (10) questions per set. The question sets in Part II were specifically related to the four fieldtrip sites viz., a brick manufacturing plant, a water treatment plant, a waste water treatment plant, and an electric generating plant - all located in and serving the metropolitan area.

The testing procedure as it was originally proposed, asked the teachers to administer the Part I pre-test within a one week period before any of their fieldtrips. The Part I post-test was to have been administered within a one week period following the completion of all fieldtrips. Appropriate question sets from Part II would have been administered following a similar pattern, i.e., administer the pre-test; allow a brief time interval; take the fieldtrip; allow a brief time interval; administer the post-test. If this type of pattern had been followed it would have minimized the number of variables in the study. However, the above design was not used at the request of the participating teachers because it would have required too many tests, viz., ten (10) tests versus four (4) tests. Since it was evident that there were very strong feelings on this matter it was decided that a weaker testing schedule was better than no testing at all! As a result a much better testing schedule was compromised.

The instructions that accompanied the test instrument asked the classroom teachers to administer the pre-test and the post-test to their own classes - usually by homeroom group. A significant departure from the instructions occurred at two of the six participating schools. At both Colonial Hills Elementary School and Worthington Hills Elementary School one teacher administered the pre-test and the post-test for the entire teaching team. Since the other teachers had precisely followed the instructions these two schools were not included in the data. This was done to eliminate the possibility of another variable. The data was thus confined to the following "treatment" and "no treatment" schools.

Treatment (Three Fieldtrips)	No Treatment (Zero Fieldtrips)
Evening Street Elementary	Brookside Elementary
Wilson Hill Elementary	Worthington Estates Elementary

The study period occurred between the administration of the pre-test beginning the week of November 29, 1971 and the administration of the post-test which began on May 22, 1972 and ended on May 26, 1972. Thus the entire study occurred over a six month period. (See the page entitled "A Schedule of the Metropolitan Environmental Education Resources Study.") There was a period of sixteen (16) weeks between the administration of the pre-test and the beginning of the fieldtrips by the Evening Street Elementary School on April 7, 1972. The fieldtrips of the treatment schools (Evening Street Elementary School and Wilson Hill Elementary School) took place during a period of nineteen (19) school days between April 7, 1972 and May 3, 1972. The fieldtrips were followed just thirteen (13) school days later by the beginning of the week during which the post-test was administered. Thus the time during which the two schools (above) were involved in the fieldtrips and the post-test amounted to a maximum of seven weeks from the beginning to the end of that phase of the study.

The 1971-72 rosters showed an enrollment of 576 fifth grade students. They would comprise the statistical sample. The students were located in six elementary schools with a fifth grade staff totaling 21 teachers. All of the fifth grade teachers had agreed to administer the pre-test and post-test instruments. They were given the option to choose none of the fieldtrips, all of the fieldtrips, or any number in between. The extent of actual participation is illustrated on the list entitled "List of Teacher Participation by Fieldtrip Sites." This tabulation indicates - (1) the schools involved, (2) the individual teachers which comprise the teaching teams involved, (3) the four possible fieldtrip sites, and (4) a comparison of the fieldtrips actually taken by classroom groups.

A SCHEDULE OF THE METROPOLITAN ENVIRONMENTAL EDUCATION RESOURCES STUDY

October 20, 1971 - preliminary meeting with teachers regarding their input and expertise in the construction of a test instrument.

October 20, 1971 - November 22, 1971 - (1) preparation of two indepenent instruments; (2) synthesis of above into one "first draft" instrument; (3) critique of first draft instrument by fifth grade teaching teams.

November 29, 1971 - December 3, 1971 - administer the pre-test instrument.

December 7, 1971 - environment oriented slide presentation - "Now It Needs Us."

December 13-22, 1971 - distribution of teacher materials - teaching unit entitled No Time To Waste, and teacher reference books entitled Everyman's Guide To Ecological Living, and National Environment Test.

January 26, 1972 - end of first semester. Unit entitled Critical Thinking & Decision Making Today, and fieldtrip observation materials completed and distributed to all fifth grade teachers.

January through February - site location and previews of facilities and "standard" tours.

March 20, 1972 - May 10, 1972 - all fieldtrips conducted during this time.

March 20, 22, 23, 24, 1972 - Worthington Hills

April 7, 12, 13, 1972 - Evening Street

April 17, 19, 20, 25, 26, 1972 - Wilson Hill

May 3, 1972 - Wilson Hill

May 3, 10, 1972 - Worthington Hills

May 22-26, 1972 - administer post-test

A LIST OF TEACHER PARTICIPATION BY FIELDTRIP SITES

	Delaware Brick Manufacturing Plant	Picway Electric Generating Plant	Morse Road Water Treatment Plant	Southerly Waste Water Treatment Plant
Brookside Elementary				
1. Marilyn Axtmann				
2. Dorothy Ford				
3. Susan Zimmerman				
Colonial Hills Elementary				
4. Diane Langner				
5. Cathy Muzilla				
6. Timothy White				
Evening Street Elementary				
7. Linda Foster		X	X	X
8. David M. Hall		X	X	X
9. Margaret Parks		X	X	X
Wilson Hill Elementary				
10. Donna Iden		X	X	X
11. Nannie Lou Johnson		X	X	X
12. Clara Smeltzer		X	X	X
13. Penny Ury		X	X	X
Worthington Estates Elementary				
14. Leah Hawkins				
15. Charles Howell				
16. Patricia MacCleary				
17. Carol Radnor				
Worthington Hills Elementary				
18. Kathy Broom		X	X	
19. Virginia McDougle		X	X	
20. W. Eugene Putterbaugh		X	X	
21. Judy Williams		X	X	

As stated above the test instrument was prepared in two parts. Part I was comprised of both attitude and factual questions. The thirty (30) questions in this section were intended to be a gauge of student attitude and knowledge in the area of ecology and environment. Questions nine (9) and ten (10) are intended to force a comparison between the students' generation and their parents' generation. These two questions were intended to give some insight into the students' self-concept. They are not intended to produce a blanket condemnation of the "older" generation. Questions three (3), eighteen (18), twenty-one (21), and twenty-four (24) were designed to probe the students' attitude regarding the political process. The author considers this to be an especially important, if not crucial, area of interest and investigation. Environmental education programs at all levels, more than outdoor education or conservation education, has placed a great deal of emphasis on social and political remedies. Therefore some profile of attitude development and change in the realm of social and political action must be established.

Questions four (4), twenty-three (23), twenty-seven (27), and twenty-nine (29), may give an indication into the future of the environment. If the students' answers indicate an embryonic "environmentally literate citizen;" and if those students can maintain an environmental point-of-view when they become self-supporting economic creatures - then progress in environmental education will have been made.

The following tabulation illustrates the breakdown between factual and attitudinal questions in Part I. It indicates there are eleven (11) factual questions and nineteen (19) attitudinal questions in this section.

QUESTION NUMBER	FACTUAL	ATTITUDE
1.		x
2.		x
3.		x
4.		x
5.	x	
6.	x	
7.	x	
8.		x
9.		x
10.		x
11.		x
12.		x
13.		x
14.	x	
15.	x	
16.	x	
17.	x	
18.		x
19.		x
20.	x	
21.	x	
22.	x	
23.		x
24.		x
25.		x
26.		x
27.		x
28.	x	
29.		x
30.		x

As stated above (p. 129) Part II consisted of forty (40) factual questions. These questions were arranged in four sets of ten (10) questions per set. However, questions twelve (12), twenty-four (24), and thirty-two (32), were deleted because they did not have a "correct" or "best" answer. The test instrument, in its final form, follows.

METROPOLITAN ENVIRONMENTAL EDUCATION
RESOURCES STUDY

STUDENT INFORMATION - PART I

PLEASE PRINT THE FOLLOWING INFORMATION:

NAME _____
Last First Middle Name or Initial

TEACHER'S NAME _____

SCHOOL _____

AGE _____ BOY _____ GIRL _____

Have you taken any outdoor education field trips with your class in the third or fourth grade?

YES _____ NO _____

INSTRUCTIONS:

1. Answer one question at a time.
2. Answer all questions.
3. Circle the letter in the front of the answer you chose.
4. If you do not know the "right" answer, pick the "best" answer.
5. Do not go back and change any answers.
6. There is no time limit.
7. This is not a test, therefore no grade will be given.

This instrument has "easy" and "hard" questions. Some parts you will know, and some parts you will not know at all. Do not worry about getting all the "right" answers.

PART I

1. The importance of ecology is
   a. Talked about too much
   b. Talked about enough
   c. Not talked about enough
   d. Of no concern at all

2. Because of man's intelligence, he is able to
   a. Control all his surroundings (environment) so he doesn't have to worry about what he does to it
   b. Adapt the environment to supply man's food, clothing and shelter so long as he doesn't change it too much
   c. Adapt the environment, but remember that each change affects him in some way

3. In an election, I believe my vote
   a. Will be of great importance
   b. Will be of some importance
   c. Will be of no importance

4. How do you see man's part in the environment?
   a. Conqueror of the environment
   b. Controller of the environment
   c. As a part of the environment

5. Which of the following is a resource that cannot be replaced (a non-renewable resource)?
   a. Air
   b. Forest
   c. Wildlife
   d. Coal

6. Ecology is
   a. Keeping the earth free from pollution
   b. The dependence of all life upon its surroundings
   c. The study of natural resources
   d. The study of life

7. The success of life in any area in which it is found depends on
   a. Climate
   b. Other life in the area
   c. Food
   d. All of the above

8. Without our industry, how many people could our country support?
   a. The same as now
   b. More than our present number (over 200 million)
   c. Less than our present number (under 200 million)

9. Today, young people take
   a. More responsibility than their parents
   b. About the same responsibility as their parents
   c. Less responsibility than their parents

10. Today, young people
   a. Know more than their parents
   b. Know about the same as their parents
   c. Know less than their parents

11. The influence of man's discoveries and inventions on society has been mostly
   a. Good
   b. Bad
   c. Neither good nor bad

12. The most important problem facing <u>mankind</u> is
   a. Pollution
   b. Overpopulation
   c. War

13. The biggest problem facing <u>our country</u> is
   a. Money problems
   b. Overpolulation
   c. Individual rights
   d. Pollution

14. Countries with a lot of industry
   a. Use more resources than countries without a lot of industry
   b. Use about the same amount of resources as countries without a lot of industry
   c. Use less resources than countries without a lot of resources

15. The country which uses the most natural resources is
   a. U.S.A.
   b. Russia
   c. China
   d. India

16. Presently, the most <u>efficient</u> <u>and</u> <u>economical</u> means of controlling insect pests is
   a. Increasing the number of insects that prey on other insects
   b. Placing insects in the environment that cannot breed to make other insects
   c. Insecticides

17. The best ecological means of controlling insect pests is
    a. Increasing the number of insects that prey upon other insects
    b. Placing insects in the environment that cannot breed to make other insects
    c. Insecticides

18. Most of our legislators (law makers) are
    a. Trying to do a good job for the people who elected them to office
    b. Only trying to get re-elected
    c. Looking out only for their own interests
    d. Doing only what the richest and most important people tell them to do

19. Many industries add to the pollution problem. They should be
    a. Ignored because the problem will go away by itself
    b. Told to correct the problem
    c. Heavily fined with the money being used to clean up the damage to the environment
    d. Made to go out of business

20. The largest single contributor to the pollution problem in this country is
    a. Private industry (factories and companies that make things)
    b. Public utilities (gas, electric, and telephone companies)
    c. The consumer or buyer (you)
    d. Nature

21. The law-making process in our country is intended to include
    a. The people
    b. Legislators (law-makers or law writers)
    c. Executives (governors and the President)
    d. The courts
    e. All of the above

22. Industry is now able to recycle
    a. Water
    b. Glass
    c. Paper
    d. Steel
    e. All of the above

23. The responsibility for a clean and healthy environment begins with
    a. The individual (you)
    b. Local (city and county) government
    c. State government
    d. Federal government (Washington, D.C.)

24. Many laws about the environment have already been added to our law books. They should be
    a. Ignored because many laws don't work anyway
    b. Thrown out because they are out of date
    c. Studied and rewritten if necessary
    d. Enforced with equal justice

25. How do you rate your <u>interest</u> or <u>concern</u> for the study of ecology and the environment?
    a. Poor
    b. Fair
    c. Good
    d. Very good
    e. Excellent

26. How do you rate your <u>actions</u> in the effort to keep a clean and healthy environment?
    a. Poor
    b. Fair
    c. Good
    d. Very good
    e. Excellent

27. If the environmental problem is as bad as some people say, we should
    a. "Live it up" because it's already too late to do anything about it
    b. Correct only the worst problems, and then hope for the best
    c. Rate all the problems and correct them according to how serious they are
    d. Correct all of the problems at once

28. Thermal pollution is the
    a. Heating of air by burning solid wastes
    b. Heating of water by power plants
    c. Heating of air by the sun due to more carbon dioxide in the air
    d. Heating of the soil due to chemicals added to the soil

29. Our future environmental problems will be solved by
    a. Making the population smaller
    b. Inventions by scientists and engineers
    c. Changing attitudes of Americans
    d. Rules made by the government

30. Littering the environment is a problem because
    a. It is ugly
    b. It is expensive to clean up
    c. It could be corrected by people throwing away their own litter
    d. All of the above

METROPOLITAN ENVIRONMENTAL EDUCATION
RESOURCES STUDY

STUDENT INFORMATION - PART II

PLEASE PRINT THE FOLLOWING INFORMATION:

NAME _____
Last First Middle Name or Initial

TEACHER'S NAME _____

SCHOOL _____

AGE _____ BOY _____ GIRL _____

Have you taken any outdoor education field trips with your class in the third or fourth grade?

YES _____ NO _____

INSTRUCTIONS:

1. Answer one question at a time.
2. Answer all questions.
3. Circle the letter in the front of the answer you chose.
4. If you do not know the "right" answer, pick the "best" answer.
5. Do not go back and change any answers.
6. There is no time limit.
7. This is not a test, therefore no grade will be given.

This instrument has "easy" and "hard" questions. Some parts you will know, and some parts you will not know at all. Do not worry about getting all the "right" answers.

SHALE

1. Shale is a
   a. Metamorphic rock
   b. Igneous rock
   c. Sedimentary rock
   d. None of the above

2. Shale
   a. Is usually found in a series of thin layers
   b. Is not a very hard rock
   c. Can be found in nature in several colors
   d. All of the above

3. A kiln is used as
   a. A clay storage area
   b. A clay mixing machine
   c. A place to harden clay products by fire

4. Bricks are made of
   a. Clay
   b. Water
   c. Coloring material
   d. Chemicals to make it hold together
   e. All of the above

5. Today bricks are
   a. Made by hand
   b. Formed in individual wooden forms
   c. Forced through a form and then cut into individual bricks with a wire cutter
   d. None of the above

6. If a newly formed brick were immediately put into the kiln
   a. It would be properly stored
   b. It would be fired
   c. It would dry out and then fall apart
   d. It would probably crack or explode

7. A common building brick (for the outside of a building) costs about
   a. Two (2) cents each
   b. Ten (10) cents each
   c. Twenty (20) cents each
   d. None of the above

8. Shale is used to make
   a. Bricks
   b. Drainage tile
   c. Roof tile
   d. Decorative floor tile
   e. All of the above

9. Shale is a
   a. Man-made material
   b. Renewable resource
   c. Non-renewable resource
   d. Not a resource at all

10. The production of bricks causes pollution
   a. Of the air
   b. Of the water
   c. Of the landscape
   d. With its solid wastes
   e. All of the above

ELECTRIC POWER

11. Today the main natural resource used for generating electricity is
   a. Nuclear power
   b. Oil
   c. Gas
   d. Water
   e. Coal

12. Name five (5) appliances in the home and estimate the energy (watts) used per day
   a. _____ _____
   b. _____ _____
   c. _____ _____
   d. _____ _____
   e. _____ _____

13. The amount of electrical energy needed in the future will
   a. Increase
   b. Stay the same
   c. Decrease
   d. No one knows

14. Most electrical power is used by
   a. Industry (factories and companies that make things)
   b. Agriculture (farmers, etc.)
   c. Individuals
   d. None of the above

15. Electrical power generating plants
   a. Must be located near a river
   b. Must be located near a source of coal
   c. Must be located near the place where the power is to be used
   d. May be located almost anywhere

16. Most of the electrical energy used in Franklin County is generated
    a. Inside the City of Columbus
    b. Inside Franklin County
    c. Within a thirty (30) mile radius of the City of Columbus
    d. On the Ohio River

17. The average suburban home has
    a. About five (5) electrical appliances
    b. About ten (10) electrical appliances
    c. About fifteen (15) electrical appliances
    d. More than twenty (20) electrical appliances

18. Fossil fuels are used to generate the greatest part of our electrical energy. These fuels
    a. Are limited in supply
    b. Are a non-renewable resource
    c. Come from the sun
    d. All of the above

19. The average suburban home uses
    a. About ten (10) kilowatt hours per day
    b. About twenty (20) kilowatt hours per day
    c. About thirty (30) kilowatt hours per day
    d. About forty (40) kilowatt hours per day

20. A kilowatt (1000) hour of electricity costs
    a. About one (1) cent per kilowatt hour
    b. About two (2) cents per kilowatt hour
    c. About five (5) cents per kilowatt hour
    d. About ten (10) cents per kilowatt hour

WATER TREATMENT

21. About 70% of the earth's surface is water. Fresh water makes up
    a. About 10% of the earth's surface
    b. About 5% of the earth's surface
    c. About 2 1/2% of the earth's surface
    d. Less than 1% of the earth's surface

22. Today every person in this country uses about
    a. 250 gallons of water per day
    b. 500 gallons of water per day
    c. 750 gallons of water per day
    d. 1000 gallons of water per day

23. A leaking faucet can waste as much as
    a. 15 gallons of water per day
    b. 25 gallons of water per day
    c. 40 gallons of water per day
    d. 50 gallons of water per day

24. Name three things in the home that use water and estimate the amount of water used per day

a. _____ _____
b. _____ _____
c. _____ _____

25. Water is special in that
    a. It can be solid, liquid and gas
    b. It can be used again
    c. Neither of the above
    d. Both of the above

26. The biggest consumer of water in our country today is
    a. Agriculture (irrigation)
    b. City and suburban personal use
    c. Industries (factories and companies that make things)
    d. Government (cleaning streets, fires, etc.)

27. Our largest fresh water resource is
    a. Ground water
    b. Lake water
    c. River water
    d. The ocean

28. When I use water
    a. I am increasing the available water supply
    b. I am decreasing the available water supply
    c. I am not changing the available water supply
    d. None of the above

29. More water is used
    a. In the inner city
    b. In the suburbs
    c. In the country

30. Without enough water man would
    a. Find a substitute for water
    b. Have to reduce the population
    c. Develope methods to increase the available water supply through advances in engineering

SEWAGE TREATMENT

31. The terms "primary, secondary, and tertiary," refer to
    a. A name for three sizes of streams
    b. The names of equipment used at a sewage treatment plant
    c. Three levels of sewage treatment
    d. None of the above

32. In spite of better and better sewage treatment plants, water pollution of our rivers has increased
    a. Two (2) times since 1900
    b. Four (4) times since 1900
    c. Six (6) times since 1900
    d. Eight (8) times since 1900

33. A city like Columbus uses as much as
    a. Forty (40) million gallons of water per day
    b. Sixty (60) million gallons of water per day
    c. Eighty (80) million gallons of water per day
    d. One hundred (100) million gallons of water per day

34. If a city is located on a north to south flowing river, the sewage treatment plant usually will be located
    a. Outside the city on the north
    b. In the center of the city
    c. Outside the city on the south
    d. None of the above

35. The most expensive level of sewage treatment is
    a. Primary (first level of treatment)
    b. Secondary (second level of treatment)
    c. Tertiary (third level of treatment)
    d. None of the above

36. Water pollution is caused by
    a. Insecticides, herbicides, and pesticides
    b. Raw sewage
    c. Acid drainage from mining operations
    d. Industrial wastes
    e. All of the above

37. Water can be used for
    a. Power
    b. Transportation
    c. Recreation
    d. All of the above

38. Water use will probably
    a. Be less
    b. Stay the same
    c. Be more
    d. None of the above

39. An effluent is
    a. The outward flow of water from a sewage treatment plant
    b. The storage area for sludge or solid wastes
    c. The name of a screen used to remove grit from water coming into the sewage treatment plant
    d. The spray coming from the aeration process

40. Chlorine added to the water (in the proper way) will kill more than
    a. 87% of the harmful bacteria in an effluent
    b. 93% of the harmful bacteria in an effluent
    c. 97% of the harmful bacteria in an effluent
    d. 99% of the harmful bacteria in an effluent

results

THE SAMPLE SIZE

When this study was begun in the fall of 1971 the rosters of all six elementary schools indicated there was a total of five hundred and seventy-six (576) fifth grade students enrolled in the Worthington City Schools. During the school year there was a net gain of twenty-two (22) fifth grade students. Thus the pre-test sample numbered five hundred and ninety-nine (599) and the post-test sample numbered five hundred and ninety (590). It was decided to eliminate those cases which had not taken both the pre-test and the post-test. As stated above (p. 130), two teaching teams departed significantly from the test instructions. These two schools (Colonial Hills Elementary and Worthington Hills Elementary) were not included in the data. Consequently the final sample size is three hundred and seventy-five (375). The "no treatment" schools (Brookside Elementary and Worthington Estates Elementary) represent one hundred and eighty-five (185) cases of the final sample, while the "treatment" schools (Evening Street Elementary and Wilson Hill Elementary) represent one hundred and ninety (190) cases of the final sample. Those cases in which only part of the test was completed were retained because it was evident that an effort had been made on the part of each student to respond to the test instrument.

THE JURY

The statistical methods used to analyze the data for this report were an item analysis and a paired t-test. The item analysis requires an answer key which indicates a "best" answer. Since there is no correct or incorrect answer to an attitude question, the test was administered to a jury of twelve (12) fifth grade teachers and eight (8) administrators, all employed by The Worthington City Schools. The administrators included five (5) elementary principals and three (3) administrators from the central office

whose responsibility was directly related to curriculum. Their test responses were simply tallied and if eighty percent (80%) of the jury agreed on a specific multiple choice answer, that answer then became the "correct" or "best" answer. As a result of the use of the jury, attitude and fact questions could be treated alike for scoring purposes. Thus, the item analysis with its set of correct answers would indicate the degree of student conformity as measured against the "correct" answers which had been determined by a jury of fifth grade classroom teachers and curriculum specialists. The jury choices are given in the tabulation below. Of the original total of seventy (70) questions, fourteen (14) of thirty (30) were acceptable in Part I. Because Part II was comprised entirely of fact questions it was not submitted to the jury. Three of forty (40) were unacceptable in Part II because - (1) a correct answer could not be found to the question; and (2), the data could not be handled in a convenient way. The total number of items used in the item analysis totaled fifty-one (51). The tabulation below indicates the final fifty-one (51) items in relation to the original number of items, seventy (70). The "correct" or "best" multiple choice answer is also given.

PART I

1.		11.		21.	mc/5
2.	mc/3	12.		22.	mc/5
3.		13.		23.	mc/1
4.	mc/3	14.	mc/1	24.	
5.		15.	mc/1	25.	
6.		16.	mc/3	26.	
7.	mc/4	17.		27.	mc/3
8.	mc/3	18.	mc/1	28.	
9.		19.		29.	mc/3
10.		20.		30.	mc/4

PART II

1.	mc/3	11.	mc/5	21.	mc/4	31.	mc/3
2.	mc/4	12.	n/a	22.	mc/1	32.	n/a
3.	mc/3	13.	mc/1	23.	mc/2	33.	mc/2
4.	mc/5	14.	mc/1	24.	n/a	34.	mc/3
5.	mc/3	15.	mc/1	25.	mc/4	35.	mc/3
6.	mc/4	16.	mc/3	26.	mc/1	36.	mc/5
7.	mc/2	17.	mc/4	27.	mc/1	37.	mc/4
8.	mc/5	18.	mc/4	28.	mc/3	38.	mc/3
9.	mc/3	19.	mc/2	29.	mc/2	39.	mc/1
10.	mc/5	20.	mc/2	30.	mc/3	40.	mc/4

Those questions in Part I which are blank were unacceptable because they fell below the eighty percent (80%) level of agreement among the jury of teachers and administrators. The mc/3 code indicates that the correct multiple choice answer for the question stem (as in the case of question number 1) is three (3). The n/a code means that a "correct" or "best" answer was not possible. Therefore an answer is "not applicable" (n/a).

THE STATISTICAL STATEMENT

At this point it would be helpful to state the hypothesis in both written form and statistical form. The central thesis of this study is "that fieldtrips are an aid to students' educational growth." Stated another way, the study seeks to determine whether change occurs as a result of a specific fieldtrip activity (the treatment). The statistical statement follows:

H_0: $\bar{X}$ pre-test = $\bar{X}$ post-test

H_A: $\bar{X}$ pre-test $\neq$ $\bar{X}$ post-test

Alpha = .05

Two-tailed test

The null hypothesis (H_0) states that the post-test mean will be equal to the pre-test mean of the sample. It is the null hypothesis that will be subjected to the test. The alternative hypothesis (H_A) states that the post-test mean will not be equal to the pre-test mean of the sample. The function

of the alternative hypothesis (H_A) is to describe " . . . the condition which, if the evidence of our sample is contrary to H_0 [null hypothesis] and points toward it with sufficient strength, leads us to reject H_0." (p. 256, Edward W. Minium, Statistical Reasoning in Psychology & Education.) Thus, if the pre-test mean and the post-test mean of the sample are not equal, and if the computed value exceeds random occurrence, then the null hypothesis (H_0) must be rejected. In the case of this study that would mean that the change which occurred might be attributed to the treatment. The term "alpha" refers to the greek letter alpha. It is used in statistics to indicate the level of significance. The rationale of the two most common levels of significance and its function are described in the following quotation - "In recent years, it has become common for research workers to evaluate the outcome of tests according to the 5% level of significance, or, alternatively, according to the 1% level. These values tend to give reasonable assurance that the null hypothesis (H_0) will not be rejected unless it really should be. At the same time, they are not so stringent as to raise unnecessarily the likelihood of accepting false hypotheses." (p. 259, Edward W. Minium, Statistical Reasoning in Psychology & Education.) In fact, this means that there is a five percent (5%) chance of accepting the null hypothesis (H_0) when it should be rejected, and the same percentage (5%) chance of rejecting the null hypothesis when it should be accepted.

The two-tailed test was specified for the following reason - " . . . it is possible to detect a discrepancy between the true value of the parameter and the hypothesized value irrespective of the direction of the discrepancy. This capability is often desireable in examining research questions."

THE ITEM ANALYSIS

The item analysis produced the summary statistics in the table below.

	No Treatment Group		Treatment Group		
	pre-test	post-test	pre-test	post-test	
	n = 185		n = 190		
Mean	22.5135	23.1297	21.7737	24.2263	
Standard deviation	5.8060	7.2779	5.8953	6.2959	
Reliability estimates	0.701	0.821	0.712	0.749	Kuder-Richardson 20
	0.639	0.777	0.654	0.693	Kuder-Richardson 21
Mean item difficulty	.559	.546	.573	.525	
Mean item discrimination	.276	.353	.276	.295	

A comparison of the pre-test mean ($\bar{X}$) of the "no treatment" group (n = 185) and the pre-test mean of the "treatment" group (n = 190) shows that the treatment group began with an arithmetically smaller (0.7398) pre-test mean score. This difference was not subjected to any statistical test of significance. It was nevertheless assumed that the difference in the mean scores were small enough so as not to be statistically significant. Therefore it may also be assumed that the two groups were essentially the same at the time of the pre-test. It should be noted that even if the "treatment" group pre-test mean was significantly less than that of the "no treatment" group - it would tend to strengthen any statistical conclusions based on a significant gain by the "treatment" group to a non-significant gain by the "no treatment" group.

The item analysis also gives an indication of the reliability of the test instrument. This is done with the Kuder-Richardson formula 20, and

the Kuder-Richardson formula 21. The ability of the Kuder-Richardson formula 21 to accurately estimate the test reliability is closely related to the item difficulty. When all items are of the same level of difficulty the Kuder-Richardson 21 gives a very accurate estimate of reliability. However, with an increased variation among the items there is a correspondingly increased tendency of the Kuder-Richardson 21 to underestimate test reliability. Since the test used in this study had a wide range of item variation the Kuder-Richardson formula 20 will be used to determine the overall test reliability. The test reliability index ranges between 0.000 for the minimum reliability through 1.000 for the maximum reliability. The test for this study was subjected to the Kuder-Richardson 20. It indicated a reliability index which ranged between 0.701 and 0.821, which, in turn, indicates that the test was reasonably reliable.

The mean item difficulty is a gauge of the difficulty of each item in the test instrument. The mean item discrimination gives an indication whether learning has taken place. If the test instrument is constructed at a reasonable level of difficulty for the group to which it will be administered, and if there is an increase in the discrimination score on the post-test then one may conclude that change has occurred. If a test instrument which is comprised of both fact and attitude questions can indeed measure educational change, and if that test instrument is designed to measure the change that results from a specific treatment (fieldtrips), then conclusions may be made and inferences may be drawn regarding the total population from which a sample is taken.

One must still subject the data to some test which will indicate whether the change which has occurred is statistically significant, i.e.,

is the computed value such that it is greater than that which one could expect as a result of random occurrence? The paired t-test will provide such an indication.

THE PAIRED T-TEST

The item analysis program allows one to request a new set of data cards. In this case the new deck of data cards included the identification numbers, the code indicating a pre-test or a post-test, and a raw score for each case. A pre-test and post-test deck was prepared for both the "no treatment" schools and the "treatment" schools. The decks were then paired by student identification number. A paired t-test program was then executed. The identification code of the particular t-test program used in this study is QAUST. It is one of many STATPACK programs which are available at the Instruction & Research Computer Center (I.R.C.C.) of the Ohio State University. The paired t-test program compared the raw scores of the pre-test and post-test for the "no treatment" schools. A similar pre-test and post-test comparison was also made for the "treatment" schools. In this way the group mean, and the standard deviation were derived. The paired t-test program then computed a "t-value" which, along with the appropriate table, indicated whether the test is significant. The results of the paired t-test for the "no treatment" schools (Brookside Elementary and Worthington Estates Elementary) and the "treatment" schools (Evening Street Elementary and Wilson Hill Elementary) follows:

no treatment group t-value = 0.9618

treatment group t-value = 5.3685

"Table D" in Minium's Statistical Reasoning in Psychology & Education, (p. 444) shows the table values for the Student's t Distribution. This

table gives the value which must be exceeded if a treatment is significant. It gives the degrees of freedom (cases) from 1 through infinity and the value for the area in one tail (of the normal curve). Thus, the value for a study with a .05 level of significance in a two-tailed test would be indicated in this table under the .025 column (the area in one tail). A portion of the appropriate table is given below.

df	.025
120	1.980
150	1.976
200	1.972

THE STATISTICAL CONCLUSION

The number of cases for the "no treatment" group was one hundred and eighty-five (185) and one hundred and ninety (190) for the "treatment" group. Table D does not show a value for these two degrees of freedom (df). To maintain a stringent criteria the larger table value (for 150 degrees of freedom) will be used. If the results of the test are significant, the computed t-value for the "no treatment" group should fall below 1.976 and the computed t-value for the "treatment" group should exceed that value. The test results indicate that significant change did not occur in the "no treatment" group. However, a significant change did occur in the "treatment" group.

It is the objective of the test design to eliminate as many variables as possible. The ideal situation would be to have only one variable which is subjected to very precise controls, i.e., it is applied to the "treatment" group as uniformly as possible. In the case of this study there were at least two variables which could not be effectively eliminated.

They were - (1) student maturation, and (2), the impact of the media on the students' environmental awareness and knowledge. However, it was assumed that this study was done under random sampling conditions and that the variables indicated above would be essentially the same throughout the entire sample in both "treatment" and "no treatment" groups.

Therefore, if one assumes that the test was administered under reasonably controlled conditions, and that the paired t-test does indicate a significant increase in the t-value - then one must reject the null hypothesis (H_0). The test results do in fact point with sufficient strength toward the alternative hypothesis (H_A) to reject the null hypothesis (H_0). Since fieldtrips were the controlled variable, one may conclude that the significant t-value increase in the "treatment" group might have been the result of the treatment.

conclusions & recommendations

CONCLUSIONS

1. The environmental "crisis" is not a myth! More and more environmental problems are brought to our attention almost daily. Awareness and appreciation are excellent beginning points but we must place a growing emphasis on knowledge and action, i.e., critical thinking and problem solving.

2. Education which deals with environmental problems is very current. As a result it has a high level of appeal to most students, which in turn reduces the need for some of the more coersive motivation methods.

3. Teachers are very interested in environmental education <u>if</u> they are adequately informed and <u>if</u> suitable materials are made available to them.

4. Environmental education has many implications for "localizing" education. If significant action programs are also a part of localized environmental education, student interest and retention should be noticeably increased.

5. The paired t-test indicated the "treatment" group had experienced a significant statistical change during the test period while the "no treatment" group had not. Thus the null hypothesis, (<u>viz</u>., that the pre-test group mean and the post-test group mean <u>are equal</u>), must be rejected. The alternative hypothesis may be accepted, (<u>viz</u>., that the pre-test group mean and the post-test group mean <u>are not equal</u>.) There is now a reasonably strong statistical indication that the change <u>might</u> be attributed to the treatment (fieldtrips).

RECOMMENDATIONS

1. Since a directory survey instrument has been prepared, additional businesses and industries should be contacted and the directory should be expanded. (This will become increasingly difficult as more and more insurance companies threaten cooperating businesses and industries with "no coverage" for fieldtrip [tour] groups.) If possible location maps could also be added to each individual directory entry.

2. More information material should be incorporated with each of the unit materials. In addition to "fact sheets" being included in the unit materials, more reference materials should be listed - and provided to the teacher(s) on a loan basis if possible.

3. More emphasis should be placed on pre-trip and post-trip activities. Pre-trip preparation should include greater use of slides which relate to (1), the general environmental problem being studied, i.e., solid waste disposal, water pollution, air pollution, etc., (2), specific local environmental problems, and (3), the actual study site(s). Follow-up should emphasize action programs.

4. The test instrument should be redesigned so that it could be administered in shorter, topical units. This would necessitate its being administered more often, but it would provide better controls while gathering the data and it would also decrease the number of uncontrolled variables in the study design and thus increase confidence in the data, the statistical conclusion, and the substantive conclusion. Thus the pre-test would be administered three to five days before the fieldtrip, and the post-test would be administered three to five days following the fieldtrip. In addition, if a specific fieldtrip, (such as the electric generating plant), could be scheduled for all participants during a five to ten day period of time, (depending on the number of schools and students involved), it would increase the validity of the study design.

5. Similar studies should be conducted in other school districts. Consideration should be given to urban participants, suburban participants, and rural participants. Comparisons should be made to see if the treatment (fieldtrips) produce greater (statistically more significant) results in one group when compared with the others. The results of any additional studies should be submitted to a central educational research clearinghouse such as the ERIC Center at the Ohio State University. Their staff should, in turn, cross-reference similar materials for easy comparison by interested readers and future researchers. If similar studies could be conducted in and near other major urban centers viz., Cleveland, Cincinnati, Akron, Canton, Youngstown, Dayton, and Toledo - all eight of Ohio's major urban centers would have been similarly tested and comparisons could be made which might have implications for environmental education for the entire state of Ohio.